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REPORT

OF THE

EVIDENCE AND OTHER MATTER

PRESENTED BEFORE A

JOINT COMMITTEE OF THE CITY COUNCIL

OF BOSTON

UPON

THE SUBJECT OF GAS.

PHONOGRAPHICALLY REPORTED BY MR. J. M. W. YERRINTON.

BOSTON:
GEO. C. RAND & AVERY, PRINTERS, 3 CORNHILL.
1867.

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The Gift of
F. B. Crowninshield
of Boston
(H. C. 1829)
7 April, 1869.

REPORT

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EVIDENCE AND OTHER MATTER

PRESENTED BEFORE A

JOINT COMMITTEE OF THE CITY COUNCIL

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THE SUBJECT OF GAS.

Boston Gas Light Company

PHONOGRAPHICALLY REPORTED BY MR. J. M. W. YERRINTON.

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1867.

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1869, April 7.
Gift of
F. B. Crowninshield
of Boston.

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PREFACE.

THE present document owes its origin to the two following orders, offered by Alderman Nash, on the 2d of April, 1866:—

Ordered, That the accompanying draught of a bill, entitled "An Act for the regulation of Gas Companies, and the better protection of the Consumers of Gas in the city of Boston,"* be referred to a joint special committee, consisting of two on the part of the Board of Aldermen, and three on the part of the Common Council, with instructions to consider and report upon the expediency of its provisions, or what other legislative action may be expedient and desirable regarding the inspection of gas and gas-meters.

Ordered, That the Special Committee on the better inspection of gas and gas-meters consider also the expediency of the manufacture of gas by the city beyond or distant from the city's limits; and of the production and distribution of gas to the citizens at its minimum cost of manufacture.

The special committee appointed were Messrs. Nash and Davies on the part of the Aldermen, and Messrs. Hyde, Stevens, and Hills on the part of the Council.

* This refers to City Document No. 44, being an Act prepared or presented by Alderman Nash on the 19th March, for the approval of the City Government, just before the close of the session of the Legislature.

After two hearings in the spring, the Committee postponed further consideration of the subject until the autumn.

On the 15th November, the following extraordinary advertisement appeared in the papers: —

CITY OF BOSTON, *City Hall, Nov.* 14, 1866.

The Joint Special Committee of the City Council, appointed to consider the subject of the better inspection of gas and gas-meters, the expediency of manufacture of gas by the city, and its supply to the citizens at minimum cost, and *the expediency of removing the gas-factories outside the city limits*, will give a public hearing at the Council Chamber, City Hall, on Monday, November 19, at 7 o'clock, P.M.

Citizens interested in the matter, especially those affected by the present situation of the gas-works, or owning real estate in the vicinity, or having complaints to make of the present measurement or rates of supply of gas, will please attend, first giving notice of the matters they intend to present to J. Lewis Stackpole, Esq., at the Aldermen's Room, in City Hall, between the hours of 4 and 6, P.M., or by letter, on any day prior to the hearing.

In behalf of the Committee,
NATHL. C. NASH, CHAIRMAN.

There also appeared in the *Boston Post* of the 3d December the following advertisement: —

CITY OF BOSTON, *City Hall, December* 1, 1866.

Persons possessing practical information in regard to the best mode of constructing gas-works for supplying a large city with illuminating gas, or possessing a thorough knowledge of the cost of manufacturing gas, are requested to call at the Aldermen's Room, City Hall, between 11 o'clock, A.M., and 2 o'clock, P.M., or address the undersigned by letter.

NATHL. C. NASH,
Chairman Committee on Gas.

After the hearings had made progress, on Saturday, Dec. 15, it was ascertained that the City Committee had begun to print the evidence before them, omitting therefrom the opening statement of Mr. Putnam, and the important testimony of Professor Rogers, both relating to the efficiency of the present State law upon the inspection of gas and gas-meters, and both necessary to a proper understanding of the merits of the case.

Under these circumstances, it at once became the duty of the Boston Gas Light Company to print a full transcript of the case, as phonographically reported.

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HEARING

BEFORE

SPECIAL COMMITTTE ON GAS INSPECTION,

FRIDAY, APRIL 13, 1866.

THE Special Committee of the City Government appointed to consider the matter of the inspection of gas and gas meters, held a meeting at the City Hall on Friday afternoon, April 13th, all the members of the Committee being present. George Putnam, Jr., Esq., appeared for the East Boston and South Boston Gas Light Companies.

After some discussion in reference to the course to be adopted in considering the several questions referred to the committee, which resulted in the conclusion that the present hearing should be confined to the matter of the inspectorship, leaving the question of the manufacture of gas by the city to be considered and fully investigated at a later period, Alderman Nash, (Chairman of the Committee,) at the request of Mr. Hyde, of the Council, stated the objections to the present law, which was passed in 1861. He said:

"It will be necessary for me to go back to the beginning of my own action in this matter, to make it intelligible to you.

"In 1858, I was a member of the Legislature, and I introduced this subject for legislation. It was referred to the Committee on Manufactures, of which I think Mr. Wentworth, of Lowell, was Chairman. No action was taken upon it for some time after it was introduced, but at length the Committee took it up, and Mr. Wentworth came to me and said — 'There has never been any legislation upon this subject, and I don't know how to begin a bill.' He asked me if I had any knowledge or information in regard to

the matter that would enable me to draw a bill. I told him that I relied upon him, as a lawyer, to draw such a bill as would protect the citizens in their rights upon this matter, as it was a thing of great importance to them, because it involved millions of dollars a year in the Commonwealth. At last he came to me with a bill, I believe, of just six lines — as inadequate a bill as could be. I said, 'This will never answer in the world.' It was then approaching Spring, and we decided that we would let the thing have the go-by that season, and make investigations upon the subject during the Summer, and be prepared the following year to present the subject again, if we saw fit. After the adjournment of the Legislature, I interested myself in the subject, and obtained information from the legislation of England upon it."

Mr. HYDE. How was gas inspected prior to the passage of this bill?

Mr. NASH. There was no inspection at all. There was great complaint by the citizens in regard to the gas bills and the quality of the gas. There were constant complaints, as every one knows, and therefore I took that subject up, as one that I might interest myself in, as a representative of Ward 10 that year.

In the year 1861, I drew and presented this bill, ["An Act for the Inspection of Gas Meters," &c.] I interested myself in it, not as a member of the House that year, but simply as a citizen, with no interest in it other than I take in the general protection of the community in such a matter; and as I had prepared that bill, I appeared before the Committee on Manufactures, of which Mr. Freeman Walker, brother of Amasa Walker, was Chairman that year. At the second hearing that the Committee had, I think, the President of the Roxbury Gas Co. came before them, and asked that they might be allowed to present a bill, for the consideration of the Committee, as the Gas Companies of the Commonwealth were then in Convention in the city. I would state, that the day before, Mr. Dexter Parker, of Worcester, was with me in the matter; but the day these gentlemen appeared, asking that they might present a bill, as I have stated, he was at right angles with me. Mr. Walker said the Chairman of the Committee had no objections, and, waving his hand round the table, the other members of the Committee assented. I said to the Chairman, after the President of the Roxbury Co. went out, "Mr. Chairman, it appears to me a strange proceeding, when you are about to frame a law to regulate and govern these corporations, that you should accept such a bill as

they might draw." He answered me by saying, that as there had been no legislation upon this subject, it was well enough to try to obtain information from every source. He went on, and the bill now upon the statute-book is the bill as drawn by the fifty or sixty corporations of the Commonwealth, (a large number, at any rate,) with the exception of four lines, which, after great exertion, I succeeded in getting stricken out. Those four lines were, as I said before the Committee, infamous. They provided that if the Gas Co. saw fit, if they had a dispute with you or me with regard to our bill, or any dispute growing out of a difference of opinion, they might come in at any time, day or evening, and take out our meter and carry it away. I stated to the Committee that it was not an uncommon thing for the children of a family to be down with measles or scarlet-fever, or other disease of a similar character, when that house was really a hospital, and they relied upon the gas as their only means of obtaining light, and that to oblige them to run to the grocer's for oil or candles was too much to ingraft upon the bill and call it just. Those four lines were stricken out, but that was all.

Mr. PUTNAM. Those lines were stricken out by consent of Mr. Dana, who acted for the Gas Companies, were they not?

Mr. NASH. The Legislature at that time was strongly Republican. The men of the old Whig party, who were balancing between their old Whig principles and going over to the Democracy, did not stand in very good odor in Boston, as everybody knows, and the stockholders of this Boston Co. being largely composed of that class of men, and a great many of them lawyers, they did not see fit to appear before that Committee, and hence they went and hired Richard H. Dana to appear as counsel against myself, a plain business man, without any more interest in this matter than any other gas taker in Boston, who consumed gas, as I did, at his house and store. That was all the motive I had. I had no other motive than the good Samaritan's, when he bound up the wounds of the man who fell among thieves. I conceived that our citizens were wounded by this Company, and I was going to see if I couldn't bind up their wounds. That is the way I looked upon it, and that is what prompted me in the matter. Of course, they had the advantage of a good smart lawyer in the case. The result was, the Committee reported this bill, which is on the statute-book of the Commonwealth. It is an *ex parte* bill; it is a bill which is of no benefit to this city, or to any city or town in the

Commonwealth, in any way, that I can discover; and I don't think anybody could discover any thing, who should go into an investigation of the subject. For instance, they say in this bill, that if a man goes to this State Inspector with a meter as perfect as a chronometer, and asks him to inspect it, if in his honest judgment he thinks it the most perfect instrument of measurement he had ever heard of or seen, and the man should ask him to give him a certificate that such was its character, he would refuse it, because the law says he shall not do it. Now, that is a very strange thing in legislation, when it is known by all gas manufacturers in Europe, as well as in this country, that gas meters are impracticable instruments of measurement, and subject to a good deal of derangement.

Then again in regard to this law: It makes one man the Inspector of Gas and Gas Meters in the city of Boston, with permission to appoint a deputy for the inspection of meters, but no deputy for the inspection of gas. Hence he must be omniscient, if he would carry out all the principles applied to the inspection of gas in England and France, where it is inspected four or five times every day and night, for he could not answer calls in Boston and Lowell, Worcester and New Bedford, the same day: it would be impossible. They got the law so framed that it should be thus imperfect in regard to the inspection of gas; they did not want the inspection followed up as it is followed up in England. The bill was ingeniously drawn so as to have the appearance of securing inspection, while really not doing it.

Then they knew very well, that the English law fixes a standard burner. It is termed the "Parliamentary standard burner." It is a burner with fifteen holes, having a seven inch chimney. That Parliamentary standard is the recognized standard to-day wherever gas is burned, both in chemical and legal tests, in courts where any action arises in consequence of complaints against a gas company. They got inserted in this bill of theirs, the provision that every gas was to be tested with the burner and under the pressure best adapted to it; — that is, ignoring the English Parliamentary standard, and letting the companies adopt any burners they pleased, and declare that they got the highest illuminating power from that particular burner: whereas, the English laws all say, that every gas shall be tested with the English Parliamentary standard burner, having fifteen holes and a seven inch chimney. I insisted upon that same mode of inspection here when I was

before the Committee. Mr. Greenough undertook to manipulate this Committee, as he did. He took them to Parker's, and feasted them with Parker-House suppers, and carried them round the city in various ways, and entertained the Legislature, and got them on his side. He had in the Legislature Mr. Harvey Jewell as his counsel, which I did not know. While I was trying to get a law through, I furnished Mr. Jewell with various documents, supposing him to be the city's representative, and interested in the very thing that I was trying to do for the city's benefit. Late in the session, I learned how he stood; but he would take all the documents, and never intimated to me that he was the Gas Co.'s counsel. I went there perfectly honest — not looking for the tricks of legislation. I should go there now better posted than I was then. I was better posted in regard to my business down town than I was in the tricks of the Legislature. There was another man by the name of Giles, who was once a hostler in a stable in Tremont Street, who was employed by the company as Dr. Hayes's assistant. Dr. Hayes was the chemist of the company, and this man, like many other bright Yankees, learned a good deal from Dr. Hayes, and after a time, they made him the head of their works. He was employed to log-roll this matter. They also had a Senator who was a stockholder in the company. You may well judge at what odds I worked, with that formidable opposition against me, in every effort that I made to procure a law for the protection of the citizens. In that way Mr. Greenough manipulated the Legislature and carried the thing his own way. I said to a Senator one day — (I forget his name now; he was from Fairhaven or New Bedford) — that I considered the mode in which they had carried on this investigation, and the way they had left the thing, as very singular; and it surprised me, that when there were so many Senators and Representatives from towns and cities where gas was used, they should pass a law of this nature, when it would amount to no protection whatever to the consumer. "Oh," says he, "Mr. Nash, you haven't given any Parker-House suppers." "No," said I, "I can't afford it, for I am here simply as a representative of the city of Boston, and am perfectly disinterested in the matter, having no pecuniary or other advantage to be gained from it."

Well, the result of it was, this law. Now, all the advantage there is under heaven in this law to anybody is this. The Gas Companies have got a State inspector of meters, and they have

shifted from themselves the inspection of the meters, and given an *éclat* to the meters, perhaps, from their bearing the stamp of the Commonwealth inspector. If there is any defect in the meter, they throw the responsibility off their shoulders, and say, "It is the business of the State to look after that matter." The result of it is, that they have got this State inspector of meters; but if you look at this law, you will see that it says, "No meter shall be set after the first day of October, 1861, unless it be sealed and stamped in the manner required by this act." Now there are in the city of Boston 20,000 houses, and it is fair to state that there are 15 or 20,000 meters in Boston to-day that never have passed inspection; because the law does not say that a bill for gas shall not be collectible if the meter was not inspected; hence the companies have been indifferent to all meters set previous to the passage of this law, because their bill is just as collectible as before. As a consequence, they don't care whether these meters are right or wrong. They are not inspected except in this way. It is provided by this law, that if you go to the State Inspector and ask him to inspect your meter, he shall do it, and if found correct, you shall pay the bill: if found incorrect, the Gas Company shall pay the bill, and furnish a new meter. It very frequently happens that the Gas Co. go to some house and find a defective meter, that has been measuring against the consumer. They discover that fact, and it is so defective that they take it away, but without assigning any reason. If it has measured against you fifty per cent for five months, they don't tell you of it. If it has measured against themselves, they know they can't collect the bill, for they can't tell how much it has measured against them — there is no record of it. I insisted that when a person asked for the inspection of his meter, it should be inspected on the spot where it stood, if it was to be inspected at all. At that time, there were a great many wet meters in Boston: they have now almost all been displaced by the dry meters. A wet meter should stand precisely plumb to measure correctly. If you throw a wet meter back, it will measure against you thirty-five or fifty per cent constantly; throw it forward, and it will measure against the Company. Hence a meter brought from your house and tested on the table of the State inspector, which is kept plumb, might be correct; but carry it back to your house, and it might go on measuring against you fifty per cent. Hence I told the Committee that it was right that the inspection should

be on the spot. Mr. Greenough asserted that the thing could not be done: I knew the contrary. I know it can be done, whether the meter is wet or dry. There is a little more work about it, and but a little.

There are thousands of meters in Boston, I repeat, that have not passed the State inspection. There is a defect in the law. The law should say, that no bill should be collectible unless the meter had passed under this State inspection, and bears the seal of the inspector.

Mr. HYDE. As a matter of fact, are the meters that are put up now, put up without having been inspected by the State inspector?

Mr. NASH. I presume not, because the law expressly says, that a meter shall not be a legal instrument of measurement, unless it bears his stamp.

Then again, as the law now is, this inspector may inspect the meters anywhere he chooses; at the manufacturer's office in Haymarket Square, if he sees fit. He may inspect fifty or a hundred of them, and put them into the manufacturer's office, and he may alter every one of them, and sell them to another town, with the State seal upon them. I am only supposing a case — what might be done, if a man or a company was disposed to commit a fraud. I say that the thing should be under the control and management of the city government of Boston, and should be so arranged that the city can protect its citizens. Look at our statute in regard to the inspection of mackerel. It gives the inspectors power even to say how many hoops shall be on a barrel. Yet the sale of mackerel does not begin to equal in a year the amount expended for gas. We have inspectors of flour, inspectors of beef, and inspectors of pork, and other articles, and yet when we come to this matter of gas, the inspection don't amount to any thing, nor will it, until it is inspected as it is inspected in London. There, the inspector is on the gas not only in the day-time, but through the whole night; but here, this inspector of the Commonwealth of Mass. may inspect the gas once a year in Lowell — if he is asked.

Now I am coming to another point. The law says, that as often as the Mayor and Aldermen of a city, or the Selectmen of a town ask for an inspection, this inspector shall go and inspect the gas — if he can. He cannot inspect it the same day in Boston and in Worcester. He cannot have a deputy to inspect the gas; tho

companies did not mean that he should have a deputy. Now, it so happens that in nineteen cases out of twenty, the Mayor and Aldermen of cities and the Selectmen of towns, are the very men who are stockholders in these companies. Are they going to call on the Inspector to inspect the gas if they know it is below the standard? I think not. I say that we want a city inspector, who can be upon this gas as they inspect in London and Paris, and all over Europe, where they have had the largest amount of experience in regard to this matter. The consumption of gas is not of very ancient date. In 1805 or 1810, I think it was, gas was first introduced into London, Pall Mall being lighted with it, and exciting the curiosity of the Londoners greatly. By the year 1815, a large proportion of the city was lighted with gas; and its use continued to increase, new companies being created, until it became a general thing all over the city, and the companies extended their works seven, eight, and nine miles beyond the limits of the city. Parliament legislated in regard to the manufacture of gas, the quality of the gas, and every thing belonging to it; and so exceedingly interested did the public become upon the subject in London, that they instituted a gas journal there, which was started by the citizens of London, and has been published weekly from that day to the present. It would be a very great advantage if this journal was on the table of our Public Library, for the citizens of Boston to read; I think they would get a great deal of information from it.

Gas was introduced into this country at a later period. This Boston Company received its charter in 1822. It has held its charter up to the present time, and has made at least two millions of dollars out of the citizens, if not three; and if you reckon the interest on their dividends, it would be nearer five. Now, I say that so long as they supply us with this article, we should just as much have an exact inspection of it as we have of the barrels of mackerel that come to this port. If we wish to have this thing so conducted that the citizens shall be protected, it should be under the control of the City Government, and no one else, as it is in London, where they have had the largest experience in regard to this matter. You may take this State Inspector and put him upon the inspection of the gas in this city, to see how many candles that gas equals, and at what time does he test it, by what standard does he inspect it? Does he inspect it in the morning, and draw it from the gas and not from the main? — because he

can go through the whole inspection in the morning or afternoon, without drawing a single particle of gas from the main in the street. The reason they are constantly inspecting it in London is because the quality varies. They have two qualities of gas in London; one that is made from Cannel coal, and another that is made from Newcastle coal. This Company here in Boston first manufactured their gas from Cannel coal, and nothing else, but lately, they have manufactured it from Pictou coal. Hence they have adopted, not the standard of Cannel coal, but the standard of coal like the Newcastle coal, in England, which is called very poor gas. The best quality of gas, such as the aristocracy use, and the only gas that is considered fit to be used in private houses, is made from Cannel coal, and is from 25 to 27 candle gas. The law says it shall be 20. Now, the Pictou coal, of which this Company make their gas, will make from 12 to 14 candle gas, while Cannel coal, as I have said, will make from 25 to 30 candle gas, and the Albert coal will make 35 candle gas; it is so full of carbon that you cannot use it without a mixture, it will smoke so, and it is mixed up in certain proportions with cheaper coal, in New York, and I suppose in Boston. There is a certain kind of Cannel coal used with the Pictou coal in Winter, because the gas is poorer in Winter than in Summer, and they cannot get along here without mixing Cannel coal with it. We want to know all these facts — the citizens of Boston want to know them.

Then there are other facts we want to know. We want to know from our City Inspector in regard to the economy of different burners. This State Inspector neither will answer any question in regard to that, nor is it any part of his business to do so. This law defines what he shall do. If he was city inspector, the citizens of Boston could call on him to give information in regard to this burner and that burner. There are thousands of burners brought into the city, and the people spend thousands of dollars upon them, that actually increase the consumption of gas from 50 to 100 per cent over the plain bat-wing and fish-tail burner. If we had this man as an officer of the city of Boston, he would tell us what burner to use, and it would be his duty to impart information to our citizens. If he is simply the State Inspector, he falls back upon what the State law says he shall do, and undertakes to do nothing more. I asked him the question the other day, if a man should come to him with a meter to be inspected, and that meter was pronounced by him, after all his experience

in inspecting, as perfect as a chronometer, whether he would give the man a certificate that it was the most perfect meter he had ever inspected in his life; and he said no, because it was not his business to do it, and the law said he was not to do it. Now, that is shocking, to an amazing degree, a man who is employed for the benefit of the citizens of Mass., and to give them information. The gas men of Mass. know that the dry meter is a failure; yet this State Inspector will not tell the citizens of Mass. that the dry meter is a failure, because, he says, it is not his business. I say it is. I say, if he knows, from any information he obtains from Europe, that the dry meter is a failure, it is his bounden duty to say it is a failure.

Now, the reason why the gas men when in convention in Europe talk plain, is because they have city and town inspectors; but here we have simply a State Inspector, whose salary is drawn from the gas companies, by a law of the Commonwealth. He does not examine any thing about it, and does not report any thing about it. Now I will read a fact in regard to the dry meter, which it was as easy for him to know as for me: —

"At a recent meeting of the Scottish Association of Gas Managers, held in Edinburgh, Mr. Robb, of Haddington, gave a summary of his experience in the use of gas meters during the last eight or ten years. He said he was rather partial to the dry meter, and anxious that it should succeed in becoming *the* meter; but he must say, that in its present and previous working, he had found great variation in the registration. Those kept constantly at work he found to give the most satisfactory results; and, contrary to general belief, they were liable to derangement by frost. During the severe winter of 1860–1, one meter (amongst others which were stopped) he examined, and found to contain a considerable quantity of hoar frost, resulting from the frozen moisture in the gas, *and to be otherwise so acted upon as to affect its working.*

"Mr. Whimster, of Perth, bore a similar testimony. He accounted for dry meters — which were used in shops, offices, warehouses, &c., and standing idle during part of the summer — *not working so well as those kept constantly* in use, from the fact that dirt and tarry matters deposited on the rubbing surfaces of the valves, from the want of gas passing, and thereby keeping it moist, get hardened; and, on the meter being again set to work, the valve was consequently prevented from fitting so closely to its seat as was required for correct measurement. He also found

that the material of which the measuring chambers were made, got hard, and on starting did not distend *so freely as when they left the maker*, and consequently registered quick. [That is against the consumer, to a very large extent.] He had tested several dry meters which had been at work for some time, and found them to vary from 25 to 30 per cent slow, and as much fast."

The fast working was vastly in excess, so that the gas people were not the losers; that was the fact about it. And the same thing applies here in Boston to every dry meter that stands in the city to-day. Hoar frost stopped many a meter in Boston last winter, yet the State Inspector never went to see one of them; he was not called upon to go and see them. If he had been City Inspector, he would have been called upon to do it, and would have reported to the City Government that they were stopped by frost; and if he had also found that they were stopped by the drying of coal tar upon the valves of the meter, he would also have reported that fact. But as State Inspector he did not do it. You see by this the importance of our having an inspector here in Boston for the city, in order that our citizens may be protected in this matter.

The meter that has always been used is an imperfect instrument of measurement, and susceptible of vast improvement; there is no question about that. The wet meter is more correct, for the consumer and the gas company, than the dry, if the water is kept at its proper level in the meter; and I have understood that a glycerine meter has been manufactured, to supersede the necessity of water; and if the dry meter had not been introduced, the glycerine meter would have been, as it has been in Europe. Now, it is not an object for the Boston Gas Co. to change 25,000 meters to-day, especially if they do not measure against them; but you take those 25,000 meters, and examine them closely, and you will find those same defects that are found in Scotland. Those defects should be corrected here by somebody, but there is nobody to do it. Now, no meter should be placed where the thermometer ever falls below 65 degs., and especially a wet meter. Hoar frost acts as soon as the thermometer falls below 32, and the consequence is, where they use wet meters, they put in whiskey; but at $4.00 a gallon, they cannot do that very economically. The glycerine meter will not freeze anywhere. Now, if there are any facts showing that to be better than the dry or

wet meter, if we had a city inspector, he would feel bound to make a full investigation, and tell us how it is; but as this man stands, he don't feel bound to do so. He is not our man; he belongs to nobody. The question with him is simply what this law requires him to do, and he does nothing more — and very little of that. He is of no benefit to anybody under heaven but just the 50 or 75 gas companies in Mass., in regard to the inspection of meters.

This law, as I stated before, was an *ex parte* law, carried through the Legislature by Mr. Greenough, by any number of Parker-House suppers.

Mr. GREENOUGH. I hope the gentleman will confine himself to the truth.

Mr. NASH. I state the fact, that that gentleman fed the Legislature at the Parker House, and the next morning took them down to make an examination of the works, and undertook to demonstrate that gas could be burned with a pressure of half an inch — combing the wool right over their eyes, as I happened to know.

Mr. GREENOUGH. That is not true.

Mr. NASH. Now, that law was log-rolled through the Legislature by the Boston Gas Co. They went into Convention with the other companies of the State, and passed that bill, which was drawn by his [Mr. Greenough's] father-in-law; it was brought before that Committee, they accepted it, and the Legislature passed it. That is God's truth, every word of it.

Now, here is the reason why I ask that this city of Boston should have its own inspector to test the quality of gas. When this man goes to work to test the quality of gas, who does he do it for? His employers. Under what pressure, upon what principle, does he test it? The quality that he will report 17 candle gas in Boston won't test in the city of London 12 candle gas, because they don't consider this gas made from Pictou coal as any thing fit to be used in a family, or anywhere except in manufactories and other places where they have to economize. In France, the nobility and aristocratic class will not allow any thing but wax candles to be used in their houses. The reason is, that gas acts injuriously on the gildings and every thing of ornament in a house, even if it is made from the best Cannel coal. So if you burn gas manufactured from a poorer quality of coal, the impurities from that gas pass into the room, and you inhale them into

your lungs; and you find that if your room is lighted with gas to the common extent, the heavier the pressure is on that gas, the hotter you feel about the head, and the more you feel of uneasiness. If we were manufacturing our own gas here in Boston, there would not be one foot made from any thing but Cannel coal, because that would be for the health of the city, and the interest and well-being of the citizens; but we should not be getting a corporation's profits, we should be caring for the best interest and health of the city. We are beginning to have regard now to sanitary principles.

Now, that is the way this law stands upon the statute-book, and I say that if any thing is to be learned from the experience of England upon this subject,—where legislation has been brought into form,—we ought to avail ourselves of it, and bring it to Boston for the benefit of our citizens. The gas men of the Commonwealth of Mass. got this law through the Legislature, and got it just to their liking, and made just such strenuous efforts as they are making now to our having an inspector in Boston; and it is a fair inference from the fact that they object to a city inspector, that they have a pecuniary interest in keeping the law as it is. It is self-evident that that is their motive in appearing here. All the experience I have had in the matter tells me it is so, and I know it is so.

These are the facts in regard to this whole matter. They may deny them. But why do they come here to deny them, if we are well protected in the matter of inspection? The law says, "Whenever requested by the Mayor and Aldermen of any city, or the Selectmen of any town, the inspector shall report to them whether the gas supplied in the respective city or town is of the legal standard," &c. But, as I said to you before, if you go into the towns and cities in the State where gas is used, you will find that the governments of nineteen-twentieths of them are composed of men who are the owners of the stock in the gas company, and they do not ask for inspection; or if they do, they ask for it when they have been making a little gas from Cannel coal. What will it be ten days after? Because a man brought in a barrel of No. 1 mackerel a month ago, you wouldn't say that the lot he brings in to-day are all No. 1; you would want to inspect them. So you want to inspect every thousand feet of gas in Boston every twenty-four hours; not once a month; not under peculiarly

advantageous circumstances in favor of the company that the inspector makes the inspection for;— that would not be right.

These are the reasons, gentlemen, why I have taken action in this matter before the city government; and there are a thousand other things that, if we had a thoroughly scientific man for city inspector, he would tell us. For instance, if there was a book kept upon the meter, where you could keep your register, and the meter man should come once a month and make his record that you had burned so many feet of gas, and you kept on that book your own record, then you would have information in regard to the quantity of gas you consumed each month. Now, you don't know any thing at all about it. I venture to say, there are hardly ten persons in Boston who can keep the record of their meter, or know any thing about it. We want an inspector in this city who shall suggest all these things to us in relation to this matter, who shall follow it up and let us know about it. He would tell you, if you went out of town, to go to the office and have the gas shut off: if you didn't, the chances would be 99 out of a hundred you would have to pay a bill just the same as if you had been at home all Summer. The consumption of gas in the city of Boston costs the city $130,000 a year at the present time. It is a pretty important bill with us; and when you come to take every individual consumer in Boston, you will see that this question is one of the greatest importance.

Alderman DAVIES. I would suggest that if there are any objections to this proposed bill, we should proceed to hear them.

Mr. HYDE. If I understand the objections made to the law as it stands they are, that we want a city inspector instead of a State inspector; that if we have a city inspector, it is desired that we shall have one who shall inspect the gas and meters more thoroughly; that the gas should be tested thoroughly and the meters tested where used; that the Inspector should be allowed to give any information which he may have in regard to gas and in regard to meters, or any facts connected with the use of gas, which his observation tells him are of importance; that the method of testing which is adopted under this State law is imperfect, and that there is a better kind of inspection; that gas meters are improved from time to time, and that the different kinds of meters should be from time to time tested, and their value made known to the public. Now, is there any thing beyond that? Of course, any improvement in the regulation of gas, in a

general way, is of value to the city, but that would seem to come under the head of the other inquiry, rather than that of the inspection of gas.

Mr. NASH. There is one other point. It would be his duty to give information in regard to the best kind of coal for the production of gas.

Alderman DAVIES. If I understand the matter right, the question is, whether we shall recommend the passage of these two orders [of March 19, 1866]. We are here, as I understand, to hear any objections that may be made to this bill.

Mr. PUTNAM [to the Chairman]. I suppose you do not propose to put in any evidence, further than the statement you have made?

Mr. NASH. I don't know that I shall. I don't propose doing so now, although I may at another stage.

Mr. PUTNAM. The Gas Companies of Boston, so far as I represent them (and I understand it is the same with the Company which I do not represent, but which obviously has an interest in this hearing), are anxious to have any amount of investigation of the manner in which they serve the inhabitants of the city. They are disposed, and they intend, to treat the citizens fairly, in respect to the purity of the gas they furnish, its illuminating power, and the accuracy of its measurement; and they desire to avail themselves, and do avail themselves, of every improvement which is suggested by more recent experiments in a science which is rapidly improving, to secure to the citizens whom they supply with gas an article of good quality, accurately measured. They did undoubtedly, as the Chairman of the Committee has suggested, for the purpose of having a standard of purity established, and one in which the public would acquiesce, co-operate in the passage of this bill, which is now the law of the State, and under which the inspection has gone on for the last four or five years; and they claim that that bill does provide the citizens of the Commonwealth with all the safeguards which are required from legislation against any inferior quality of gas, or any incorrect measurement of the gas which they furnish. To carry out the provisions of this Act of 1861, the Gas Companies have been at large expense. They have provided a very expensive apparatus, the operation of which I desire you gentlemen to witness, before we close this hearing. They have had to pay the salary of the inspector for three or four years; and now it is proposed that these Gas Companies, doing business here in Boston, shall, in

addition to this State inspection which they have to pay for, provide a separate inspection within the city, which really we do not think will accomplish any thing more than can be accomplished by a State inspection, within the scope of the present Act; that is, nothing more, so far as the provisions of the bill which it is proposed to pass are proper and reasonable: there are one or two provisions which I think I shall be able to satisfy the Committee are improper and unreasonable. The rest of the provisions of the bill, I repeat, are amply covered by the law now in force.

You will excuse me if I read here at some little length the provisions of the Act passed in 1861, because it is important to understand what we have got now.

Sect. 1 provides that "the Governor shall, with the advice and consent of the Council, appoint an Inspector of Gas Meters and of Illuminating Gas, whose office shall be in the city of Boston, and whose duty it shall be when required, as is hereinafter provided, to inspect, examine, prove and ascertain the accuracy of any and all gas meters to be used for measuring the quantity of illuminating gas to be furnished to or for the use of any person or persons, and when found to be correct, to seal, stamp, or mark all such meters, and each of them, with some suitable device, and with his name, the date of his inspection, and the number of burners it is calculated to supply. Such device shall be recorded in the office of the Secretary of the Commonwealth."

Now, you will remember, gentlemen, that the three things to be provided for are accuracy of measurement, purity, and illuminating power; and this law provides, in the first place, for an inspection of the meters by the Inspector, and that he shall affix to them some suitable device to show that they have been tested by the State Inspector. Then it provides for the term of his office, and for a salary of three thousand dollars, to be paid out of the treasury; but the expense, as you will see hereafter, is to be paid by the Gas Companies. Then it goes on to provide that the "inspector shall not in any way or manner, directly or indirectly, be interested pecuniarily in the manufacture or sale of illuminating gas or gas meters." It provides that the Inspector shall not have any interest in any particular set of meters, or any particular gas company; because, if he was interested in the success of any particular meter or gas company, his prejudices might be expected to govern his action.

Mr. NASH. That was in my bill, and they copied it from it.

Mr. PUTNAM. He "shall not give certificates or written opinions to any maker or vendor of any meter, or of any such article or commodity" — that is, "any article or commodity used by gas light companies." That seems to me to be an eminently proper provision, because, if the Gas Inspector was allowed to give a certificate to a particular meter, that this was the best meter ever invented, don't you see what a door would be opened to corruption? Don't you see that even if the Inspector was the most honorable man in the world, and refused the great bribes that might be offered for his certificate in favor of any particular meter, yet the public would suspect all the time that he was in the employ of some gas meter manufacturer, and that his certificates of the goodness of meters were paid for? Of course it would be highly improper to allow a Gas Inspector, whether of the city of Boston or the Commonwealth to give his certificate of the goodness of any particular meter, or any particular manufacturer, or any particular kind of meter. His certificates of the goodness of meters are not wanted, and he could not be allowed to give them, without introducing the greatest danger of fraud and corruption. Therefore this provision seems to have been very wisely introduced, not so much for the benefit of the corporations, which could guard against any corruption of that kind, as for the benefit of the public, which could not guard against an inspector's being in the pay of any particular company or manufacturer. That provision was wisely introduced, and I don't think the Committee will be likely to leave it out of any bill which they may deem best to propose to the Legislature.

Then it goes on to provide, by section 3d, that "said inspector shall, within three months of his appointment, furnish to the Treasurer and Receiver-General a list of all the Gas Light Companies in the Commonwealth; and his salary for the year then commenced, and annually thereafter, shall be assessed and paid into the treasury of the Commonwealth by the several Gas Light Companies in this Commonwealth, in amounts proportionate to their appraised valuation."

So you see that the Gas Light Companies are called upon to repay to the Commonwealth the amount which has been paid out for the salary and expenses of this inspector.

Then it provides for the appointment of Deputy Inspectors — Deputy Inspectors of meters only, it is said. Very true. He can appoint Deputy Inspectors of meters here in Boston, and if

one man cannot make all the necessary inspection of gas alone, after he appoints deputies to inspect the meters —

Mr. NASH. They are *temporary* deputies.

Mr. PUTNAM. "He shall appoint temporarily, *and for such time as he may deem expedient*, one or more deputy inspectors," &c. It is only limited by his term of office. He may appoint as many and keep them in as long as he pleases; and then he is at liberty to go about and inspect the gas in all the towns of the Commonwealth, whenever he is called upon to do so. These deputies are subject to the same restrictions in regard to not having any interest in meters or gas companies that the Inspector himself is, and are to be paid "by fees for examining, comparing, and testing gas meters, with or without stamping them." It is provided, also, that there may be an appeal from the Deputy Inspector to the State Inspector, by the gas company or the consumer.

Then there are provisions for the inspection both of gas and gas meters, and for a sufficient staff of inspectors to examine gas and gas meters in all parts of the Commonwealth; that is, what was deemed then sufficient, and experience, I venture to say, has not proved the contrary.

Then section 5 goes on to provide a standard or unit of measure for the meter, and the size of the cubic foot; — but about that there is no contest; it is agreed that that is the cubic foot all over the world.

Then it provides that after October, 1861, "no meter shall be set unless it be sealed and stamped in the manner required by this Act." That provision has been fully carried out. You will hear, when we go into the evidence, that neither of these gas companies that I represent, and certainly not the Boston Company, has set any meter since that time, whether old or new, without getting the inspection of the Gas Inspector.

Then it goes on to provide that the Gas Companies shall have a standard measure of the cubic foot, and such apparatus as is necessary for the measurement of gas, at the office of the Inspector.

Then it further provides that every gas-light company having a certain capital, shall set up at some convenient place on its premises a gas-holder (and that you will see and understand by and by), in order that the Inspector may make proof of meters on the premises of the company, and have every facility for doing it. Then it goes on to provide that every gas company shall have a test meter, "to be used in cities and towns where no test gas-holders are

provided, or whenever proving by a gas-holder is impracticable or inconvenient." That you will find is not so good a way, by any means, of proving meters as by the gas-holder; but in some cases it is impracticable to use the gas-holder, and a meter is used instead. Then it is provided, that " in the examination of a meter, the Inspector shall see that it is of an approved principle, and shall give his particular attention to the measure of the dial-plate; he shall prove the meter when set level, and for each burner which the manufacturer has stamped it to register, it shall be capable of passing gas accurately at the rate of six cubic feet per hour; and no dry meter shall be stamped correct which varies more than two per cent from the standard measure of the cubic foot, and no wet meter shall be stamped correct which is capable of registering more than two per cent against the consumer and five per cent against the company." Then he shall keep a record of these inspections; and that record will be shown to you, and you will see how very slight the inaccuracy of the meters which are furnished to consumers in the city is; for every meter which has been inspected during the whole time of the existence of this office has been recorded, and the results will show that the error is very trifling indeed.

Then the next section provides that " meters in use shall be tested on the request of the consumer or the gas-light company, in the presence of the consumer if desired," so that anybody who wants to have his meter tested has only to send word to the Inspector or to the Gas Co. I believe the practice is, to send to the Gas Co., and the Co. send for the meter, and send for the Inspector to test it, — the consumer is notified and is present if he desires to be, — the Inspector tests it, and if the meter is found to be correct, the party requesting the inspection pays the fees; if found to be incorrect, the company pay the expenses and furnish a new meter. So that there would seem to be an ample remedy against any defects in the meters, if any arise.

These are all the sections that refer to the measurement of gas, and now I will explain to you a little the manner in which gas is measured. I have here a little dry meter, with glass sides, which will enable the Committee to see how this thing is done. You perceive that this meter consists of a box divided into two compartments, the one at the top considerably smaller than the one at the bottom; and the bottom compartment is divided perpendicularly into two apartments. The gas comes in at the inlet-

pipe, and follows the course of that pipe until it emerges into the upper compartment, at the hole which I point out. The gas coming into this upper compartment finds its only outlet through a slot which opens into one of these diaphragms, — so called, I suppose, because of their resemblance to the diaphragm in the human body, — which are leather bags, with a broad, flat tin plate upon them. The gas going into that diaphragm causes it to expand, and this expansion moves a clock-work, which operates a little valve, and the operation of that valve covers the slot through which the gas passes into the diaphragm, so that the gas can no longer go into it; the very act of filling the diaphragm has caused a movement of the valve which covers up the slot by which the gas went in. But at the same time that the opening into the diaphragm is closed, the same valve which closes that hole, opens another into this lower compartment outside the diaphragm, so that then we have the diaphragm full, and the gas pouring into the lower compartment, outside the diaphragm. Of course, the whole pressure of the gas is upon the outside of the diaphragm, and tends to close it up. In closing this diaphragm up, it presses the gas out of it, and the only outlet is through a third slot, into the outlet-pipe. The instrument is so arranged, that a certain number of movements of the diaphragm shall correspond to the movement of a certain amount of gas, and shall indicate a certain number of feet on the index. [Mr. Putnam inflated the diaphragm, to show its practical operation.]

Mr. Hyde. How much do they hold?

Mr. Putnam. They are made of various sizes, from a meter only capable of measuring the gas for two or three burners, up to one large enough to measure all the gas used in this building. The diaphragm is in proportion to the size of the meter. There is a movement of the clock-work every time the diaphragm is filled. I have described it as if there was but one diaphragm, but there are in fact two, so as to prevent the action from being intermittent.

If the meter gets out of order, for instance, if these valves get clogged, or if frost gets into the valves, the gas will begin to pass through without being recorded. So if there should be any holes in the diaphragm, or the diaphragm should leak, of course the consumer would get his gas for nothing. It is difficult to conceive of any way in which a meter should register much, if any, against the consumer. The only thing that can operate against

the consumer, and that but very slightly, is in case the diaphragm should get very stiff, so that the folds of the leather would not straighten out and make a perfect cylinder. You understand that the meter cannot work unless these diaphragms have full play, so that if the leather should get so stiff that the diaphragm would not work its full stroke, then the meter would not record at all, because the clock-work would not be moved, and the gas would get through without being registered. The leather might possibly (practically, I don't think it ever does) get so far stiffened, that, although the diaphragm would work its full stroke back and forth there would be very slight indentations in the leather, that would not get filled up; just exactly as a mustard-box, if you made a dent in it with a hammer, would not hold so much mustard as before. But that, you see, must be a very trifling matter, because the diaphragm has got to be filled, and pressed out to its utmost capacity, in order to turn the clock-work and move the hands.

Mr. HYDE. What is the effect of more or less pressure?

Mr. PUTNAM. I believe pressure does not affect the working of the meter at all,—it affects the burning. A meter measures just as accurately with a pressure of three or four inches as with half an inch. When we come to the evidence, you will see that these meters measure with great accuracy. Lumber, a much more expensive article, is not measured with any thing like the accuracy with which this machine measures gas.

Without concluding his opening, Mr. Putnam gave way for an adjournment to Monday evening, at 6 o'clock.

SECOND SESSION.

MONDAY, April 16.

The Committee met, agreeably to adjournment, all the members being present. Mr. Putnam resumed his opening, and spoke as follows:—

At the time we broke off at the last meeting, I was explaining the action of the dry meter, and I believe I had explained it sufficiently to enable the committee all to understand it. I have here, however, a meter in which the works are all exposed, and if the matter is not already clearly understood by any gentleman, I will explain it further.

I shall not go into any detailed explanation of the various forms of wet meter. They are all on the same principle, although there are great differences of detail in the construction. The wet meter consists, substantially, of a cylinder divided into four chambers. A little more than half the cylinder is below water, the rest is above. The gas comes in at the bottom of the meter, and rising in the water, fills one of these hollow chambers. It is like an overshot water-wheel, with four buckets, if you can conceive an overshot water-wheel with only four buckets. The gas rises up into one of these buckets, and the pressure of the gas on the bucket turns the wheel. When the bucket is full, its rim rises out of the water, and the gas then escapes into the upper part of the meter. While the gas is escaping from that full bucket, the next chamber below is being filled, and when the rim of that bucket rises out of the water, another bucketful is discharged into the upper part of the meter, and passes off through the outlet pipe. The capacity of four of these buckets is discharged at every complete revolution of the wheel, and passes off through the pipes, and the revolution of the wheel turns by clock-work these index hands, in substantially the same way as in the dry meter.

The defects of that meter were, in the first place, that every thing depended upon the water level being preserved, or preserved within a very slight variation. Now, water will expand with heat and contract with cold; it will evaporate; it is liable to be drawn off by fraud or accident, and consequently, it was a very unreliable substance for the gas companies or for individuals to trust to. If there was too much water in the meter, — that is, if the water expanded with heat or if too much was put in to start with, the meter would register fast. If there was too little water originally, or if the water was drawn off, or if it evaporated, or if it was contracted by cold, the meter would register too slow; consequently, any consumer who could manage to draw off a little of the water, of course got a considerable portion of his gas for nothing. Then, again, in the winter, the water would freeze up, and then the meter would not work at all, and people were left in the dark, and the gas company had to put in a new meter, or take it out and thaw it. That difficulty they undertook to remedy by putting in whiskey or alcohol, or some liquor which did not freeze; but the trouble with that was, that those liquors which do not freeze, evaporate very fast. Then they put in a bird-fountain — an inverted vessel of water above the level of the water in the meter and opening into it so that as the water falls in the meter its place is supplied by water from the bird-fountain. The water is kept in the bird-fountain by atmospheric pressure — no air being admitted into it.

Mr. Hyde. Like an improved ink-stand.

Mr. Putnam. Just exactly like the latest and best improved ink-stand.

In addition to this bird-fountain, which was to keep up the supply of water which might be lost by evaporation, they had a waste-water box, which is a comparatively simple thing. Simply a box outside and separate from the meter, but communicating with it by a hole just at the water level, so that the water could not get higher than the hole; so that, between the waste-water box and the bird-fountain, they could keep the water at a certain level for a certain time; and if they used alcohol, they could keep it from freezing. But still, these bird-fountains had to be filled up quite frequently. But perhaps the greatest objection of all was, that if the meter was tilted one way, it would register too fast, and if tilted the other way, it would register too slow. Any consumer had it in his power, by giving the proper tilt to the

meter, to cause it to register slow. Moreover, by a little tilting, and spilling the water out into the waste-water box, and then letting it down from the bird-fountain, and then again tilting it, and spilling more water, the bird-fountain could be nearly emptied; and after the bird-fountain was nearly emptied, a considerable tilt would send the water over into the wash-water box, and lower the water permanently.

Mr. NASH. Couldn't the meter-man tilt it as well for the advantage of the company?

Mr. PUTNAM. The meter-man might set the meter originally a little out of plumb, but the consumer has his meter always in his power. He may tilt it when in use, and put it back again when out of use. It is very easy for either the consumer or the meter-man to tilt the meter, but I don't think the meter-man would have the same opportunities as the consumer. But I am not speaking now in the interest of the gas companies in this matter. It is for the interest of neither party to have inaccurate meters. I do not want the consumer to get any advantage over the company, nor the company to get any advantage over the consumer, and you do not, gentlemen. And I should like to allude at this point to the suggestion that has been thrown out here, that the gas companies are in favor of the meter which favors them, and the consumers ought to be in favor of the meter which favors them. Now, I say that both the public and the gas companies want an *accurate* meter — a meter that favors nobody; and it is just as bad, to say nothing of the moral question, — it is just as bad policy for the public to have a meter which favors any single individual, as it is to have a meter which favors the gas companies, because whatever gas is stolen by the fraud of the individual consumer, is waste gas, and has got to be paid for by somebody. Whether it is paid for by the gas company or the consumer, it increases the general charge for the gas. Of course, you see if only ten per cent is lost, there is a very great saving to the consumers in the price of the gas, being less than it would be if forty per cent were lost. In other words, if individuals cheat the company, it is really the community that is cheated, because they have to pay for the gas.

Mr. HYDE. How often, when properly filled and not tampered with, did the water-meter ordinarily require to be filled with the bird-fountain?

Mr. PUTNAM. I don't know that I can answer that question; there will be witnesses here who can. About once in three months,

my impression is. It depends somewhat on the location. Of course, evaporation and heat and cold have a great effect, and the gentlemen of the Committee will remember that the gas companies cannot choose the position where they will put the meter. They generally have to put them in the cellar; people don't want them in their entries.

Mr. NASH. Couldn't they be put in the kitchen? It would cost a little more.

Mr. PUTNAM. They could be, if the parties desired it; but perhaps it would be rather too warm.

Mr. NASH. I would ask any manufacturer if a temperature of 65 degs. is not the best temperature for a meter to be placed in?

Mr. PUTNAM. It is better for a wet meter to be in some even temperature. What that temperature is I am not prepared to say. It is desirable that the temperature should be even, and the condition of the atmosphere as even as possible. But meters have to be placed where they can be conveniently placed.

Now, then, another difficulty in regard to these wet meters arises from the law. The difficulties I have already mentioned had caused them to be rapidly superseded, and the law finished them by providing, precisely as the English law provides, or substantially as the English law provides, that no wet meter shall be stamped correct, which is *capable* of registering more than two per cent against the consumer and five per cent against the company. Now, a wet meter cannot be made that is not *capable* of registering more than two per cent against the individual and five per cent against the company; so that it is really almost impossible to make a wet meter that shall come up to the requirements of that law. Nothing but constant watching and supervision will keep them in order. A wet meter, when it is first made and properly adjusted, is as accurate as an equally good dry meter; it is no more so; they are both accurate when they are new and just adjusted. But the wet meter does not practically answer the purpose for which it is designed, so well as the dry meter, because it is more liable to be affected by the changes of temperature, leakage, motion, want of plumb, and a thousand little variations that do not affect the dry meter. The dry meter may be tipped considerably without having any effect upon it at all. Of course, heat and cold have no effect upon it at all. Excessive moisture and excessive cold, it is said by the Chairman, cause frost to accumulate in the meter. I have never heard of any such in-

stance, unless that may be regarded as one which was read by the Chairman on Friday; but I have already attempted to explain to you, that if any kind of obstruction exists to the full operation of these valves, the effect must be, either that the gas does not go through at all and the meter stops, or that it goes through for nothing. The effect of any want of tightness in these valves would be to allow the gas to escape into the outlet pipes, without going through the diaphragm, thus escaping unmeasured. No accident of that kind can benefit the company at the expense of the individual. But I desire to have, and you of course desire to have, meters that shall be accurate for both company and individual; and it is nothing in favor of a meter that it benefits the company at the expense of the individual, or that it benefits the individual at the expense of the company. The interests of the whole community require that the meters should be accurate, so that dishonesty, either on the part of the company or the individual, shall fail of cheating the persons who really pay for the gas. It is for these reasons that the wet meter has been almost entirely superseded.

Mr. NASH. Won't you show the Committee how a man can test whether a wet meter is correct or not?

Mr. PUTNAM. I can't do it, sir. I am not a manufacturer.

Mr. NASH. There is a screw in the meter, and if you take that screw out, and the water just barely weeps through, you know the meter is right.

Mr. PUTMAM. I presume that is so.

Mr. NASH. Will you tell the Committee how, after a meter is attached to the couplings, the consumer can tamper with it?

Mr. PUTNAM. I cannot, but the witnesses will. I understand that a meter can be tipped.

Mr. NASH. It can when there are no couplings on it. It can at the time of setting.

Mr. PUTNAM. It is certainly practicable for the consumer to uncouple a meter and set it back.

Mr. NASH. He must lengthen his pipe if he sets it back.

Mr. PUTNAM. It can be done. Most of the consumers are honest, I know, but there are some who are disposed to cheat. I saw an attempt of that kind to-day. A man had undertaken to attach a pipe just below the point where the gas enters the meter, but not understanding fully the construction of the meter, he had drilled his hole only through the outer casing of the inlet pipe,

and evidently attached a pipe to get gas — but probably did not succeed.

Mr. HILLS. What would be the effect if the pipe was reversed in the wet meter?

Mr. PUTNAM. It would not go at all. The effect of reversing the dry meter would be, that the machinery would all work backwards, and either it would count backwards, or would not count at all. But they have a stop in the meter, so that it cannot work backwards.

Now, I do not mean to say that the dry meter is an absolutely perfect instrument. It has been fifty years coming to the point at which it has arrived, and so has the wet meter. Neither of them is perfect, but this dry meter is the best thing that is known now; and taking it all in all, it is better than the wet meter. Either of them are perfect machines for registering when they are in perfect order, but the dry meter keeps in order the best. No doubt it will be improved upon; and whenever any great, substantial, marked improvement is made, undoubtedly that improvement will be adopted, because it is for the interest of all parties that an accurate register should be found. But at present, the dry meter is the best thing there is. It is wonderfully accurate; accurate enough for all practical purposes; and there is no reason why any thing else should be substituted for it.

Now, so far as the proposed action on the subject of the inspection of meters is concerned, I don't see that any change in the law is called for by the Chairman's proposed bill, excepting one or two which I will mention. In the first place, the new law proposed by the Chairman requires that the meter shall work at a pressure of a quarter of an inch. I suppose I must explain a little what is meant by a pressure of an inch or a quarter of an inch. A pressure of a quarter of an inch means a pressure equal to the pressure of a column of water a quarter of an inch high; a pressure of three inches means a pressure equal to the pressure of a column of water three inches high. Now, the ordinary pressure at which gas is burned here is about equal to the pressure of a column of water two inches high;—I mean, the pressure upon the meter. This proposition for inspection calls for a pressure upon the meter of only a quarter of an inch. Well, I cannot say that that is absolutely impracticable, because I suppose nothing is impracticable in engineering. The Jew in "Kenilworth" speaks of his balances as so perfect, that "a hair of the high priest's beard

would turn them," and I suppose that a meter can be made so exceedingly delicate as to work with a quarter of an inch, an eighth, or a sixteenth of an inch pressure, or any appreciable quantity of gas; but it is not practical. Nobody ever wants a meter to work with a pressure of a quarter of an inch. If it did work, the gas would not come out with sufficient force to burn. It would be of no use to anybody to have it. I don't say that the meters won't stand that test, but I say it is an unreasonable and uncalled-for test. Half an inch is all that is called for by any English law; and I am not aware of any law that calls for meters working at so ridiculously small a pressure as quarter of an inch; and it is simply an unreasonable requirement.

The next innovation that is proposed here is that the test must be made on the premises of the consumer, if desired. Well, gentlemen, some of you have seen how that test is made. One gentleman of the Committee [Mr. Davies] has been to the Gas Inspector's, to my knowledge, and seen the machinery for testing the meters; and the law requires that such machinery shall be provided for that purpose; that each gas company shall provide it, and that the State Inspector shall be provided with it, at the expense of the gas companies. That machinery which is necessary for testing a meter properly is altogether too large to be moved about from place to place; it is heavy, substantial, solid work. I will describe it to you. In the first place, there is a copper vessel of the capacity of a cubic foot of air, or gas, or any other fluid, according to the measurement which is provided in this law, and which is the same as that adopted in the English law, and the same as that adopted in the proposed law of the Chairman. This copper vessel is filled with air or gas—it makes no difference which. It has got a cubic foot of gas in it; for air is a gas, when you speak scientifically. Then there is what is called a gas-holder, which consists of two cylindrical vessels, one of them open at the top and the other open at the bottom; the one open at the top slightly larger than the one open at the bottom, so that the smaller one will slide down into the larger. The larger vessel is filled up to a certain height with water, and the smaller vessel is placed on top of it. Of course, you see it cannot go down without pressure, or without a hole being made at the top to let the air out. If a hole is made at the top to let air out, this smaller vessel will sink down into the water in the larger vessel, and then, upon closing the hole at the top of the

smaller vessel, you will have this smaller vessel sunk down into the water of the larger vessel as deep as you choose. Now, this smaller vessel is heavy enough to sink; but it is counterpoised by weights on pulleys, which tend to draw it out of the water. It is so arranged, that when there is no gas or air let into it, it will of its own weight sink into the water. It is the same thing as the great gasometers in various parts of the city. Now, we will suppose that this gas-holder is made large enough to hold five cubic feet. We will suppose it to be empty of gas, and of course sunk down into the water. This measure containing a cubic foot of gas is connected with it, and a cubic foot of gas is forced into the gas-holder: that causes the gas-holder to rise, and the extent of the rise is marked on the index. Now, when a meter comes to be tested, four or five feet of air are introduced into this gas-holder. When four or five feet of air or gas have been accurately measured and put into the gas-holder, the meter to be tested is connected with the gas-holder, and the air is let out of it into the meter. Now, as the air passes out of the gas-holder by the pressure of the weight of this upper cylinder, it is registered by the meter; and if the meter is accurate, as soon as it shows that a foot has gone through it, the gas-holder ought to show that a foot has passed out. The gas-holder is perfectly accurate; it has been carefully measured and arranged, and one, two, three, four, or five cubic feet of air carefully measured and introduced into it. Now, if the meter is correct, the index will indicate a foot at the same moment that the index of the gas-holder indicates that a foot has passed out. If it does not so indicate, then there is an error in the meter, and that error is ascertained; if it is large enough to be worth considering, the meter is condemned; if it is trifling, and the meter is accurate enough for all practical purposes, it is sealed and passed.

That is the process of inspection. You see that it requires necessarily a large and cumbersome apparatus, which cannot be carried round from house to house; and if you are going to test people's meters at their houses, you have got to invent some simpler and smaller apparatus. Now, I don't mean to say such a thing cannot be done; for, as I said before, every thing is possible in engineering. Mr. Stimson can invent an apparatus which will enable him to go round and test the meters in people's houses. A test meter might be made sufficiently accurate to test

them. Something of that sort might be done, but there has nothing of the kind been done yet.

Mr. NASH. No trouble in doing it?

Mr. PUTNAM. Yes: there would be a great deal of trouble and expense, which would of course add to the cost of the gas; and the results would not be so accurate and reliable, for observations taken in a man's cellar cannot be expected to be so accurate as observations taken with the machine you, sir [Mr. Davies], saw yesterday in the Inspector's office. Observations taken in a man's cellar, and subject to the inconveniences incident to the position of the meter, such as imperfect light, irregular temperature, &c., cannot be expected to be very accurate. These difficulties can be obviated; the thing can be done; if any intelligent committee of the Legislature say that it is necessary, for the protection of the consumer, that the thing should be done, it can be done; but it is not, I say, a practical thing.

Mr. NASH. Is there any more trouble than in going round and testing grocers' weights and measures?

Mr. PUTNAM. It is more trouble, inasmuch as it requires a nicer apparatus, and more careful observation.

Mr. NASH. It only requires a meter.

Mr. PUTNAM. It requires a particular condition of the atmosphere and of temperature to adjust it with entire accuracy. It can be done, but there is nothing to be gained by it; and it can only be done by great delay and expense, and a great deal of trouble. There is no advantage to be gained from it unless you have an entire distrust of your Inspector. He is a sworn officer, and if you cannot trust him, you had better have no inspection all. If you can trust him, let him inspect these meters at his office.

Mr. NASH. You said the other night, that if a meter was found incorrect, the consumer went to the company's office, and they sent a man who took the meter off and carried it to the Inspector. Suppose an employee, — and an employee oftentimes does things for those who employ him that the employers would not do for themselves, — suppose an employee finds hoar frost in a meter, and takes it down to West Street before it goes to the Inspector?

Mr. PUTNAM. Of course, he is bound to take it to West Street.

Mr. NASH. Why? What business has he to take it to West Street?

Mr. PUTNAM. Because he is their servant, and is bound to do what they tell him to do. The gas company are bound to take it to the Inspector's office, but their agent will carry it where they tell him to. Whether their agent does carry the meters to their office or to the Inspector's office is more than I can tell. It ultimately gets to the Inspector, and if it is wrong, it is condemned, and if it is right, it is sent back.

Mr. NASH. Suppose it is full of hoar frost, and that is taken out before it goes to the Inspector's office?

Mr. PUTNAM. If it is right when it goes back, that is all that is wanted. If there is hoar frost in it, it will be for the benefit of the consumer.

Mr. NASH. Suppose it is clogged with coal tar?

Mr. PUTNAM. I am satisfied that will be for the benefit of the consumer.

Mr. NASH. I am satisfied of the contrary.

Mr. PUTNAM. The Committee will take the evidence, and not your assertion nor mine.

Mr. NASH. I take the English tests.

Mr. PUTNAM. They have not been presented yet. I shall be glad to see them.

Now, if this change is called for, there is nothing to be done that the State Inspector cannot do as well as if you had a city inspector. Suppose the meters were to be inspected at people's houses, it could be done by the State Inspector as well as by anybody else. He has an ample force to do it now, but he does not do it, because it is not a practical way of doing the thing. It is an inconvenient, expensive, troublesome, inaccurate method, and a method for which, as yet, no means have been invented, although, as I say, as scientific men can do any thing, some means would be invented if such inspection was called for by the law. But I would sugest here, that the city has no special guardianship over the rights of its citizens more than the Commonwealth has over the rights of all the citizens of the State. If the Commonwealth provides for the protection of all its citizens, there is no reason why the city of Boston should step in and insult the Commonwealth by saying that she will take care of her own citizens. There seems to be no good reason why any greater protection should be given to the citizens of Boston than to the citizens of other parts of the State. But in these respects, the law already provides for every thing requisite or desirable. The other mat-

ters in regard to which alteration is called for seem to be too trifling — I was going to say, too ridiculous — to be made the subject of additional legislation.

Mr. NASH. Why do they appoint inspectors for every town and city in England, Scotland, and Ireland?

Mr. PUTNAM. The city of London contains five times as many inhabitants as the whole Commonwealth of Massachusetts.

Mr. NASH. There are a great many cities that have their inspectors that are no larger than Boston.

Mr. PUTNAM. It is natural, of course, that in a single city where there are five times as many inhabitants as in this Commonwealth, there should be one or two more inspectors than there are in Massachusetts. How many inspectors there are in London, I don't know. The population of Great Britain is fully equal to that of the United States, or very close upon it, at all events. Of course, things are on a much larger scale than in Massachusetts.

Mr. NASH. They require the inspectors to inspect day and night.

Mr. PUTNAM. You are speaking of the inspection of gas. I have not got to the queston of the inspection of gas; I am speaking of the inspection of meters. The inspection of meters in England is under a general law, applicable to the whole country. Local inspectors are appointed, undoubtedly, by local boards, *and paid by local boards;* they are not paid by the gas companies. Here the whole thing is taken in charge by the Commonwealth. A State Inspector is provided for; and to start the office, a man is appointed of world-wide reputation, — a man who has not his superior in this country as a scientific man [Prof. Rogers], — and they give him power to appoint agents all over the State, who are to report to him as their chief. For a State like Massachusetts, I say, that was a more sensible way than to authorize the several corporate towns and cities over the Commonwealth to appoint local inspectors, who should be responsible to nobody. But, as I have said, the gas inspection law of England is very similar to ours, except that the matter being one of so much greater magnitude, local inspectors are appointed all over the country; for, as I say, the city of London alone contains five times as many inhabitants as the whole State of Massachusetts, and probably one hundred times as many gas consumers as this State, because all the inhabitants must be gas consumers.

So much for the inspection of meters. Now, when you come

to the question of the inspection of the purity and illuminating power of gas, you come to quite a different question. The inspection is not so important as that of meters, because any great defect in purity or illuminating power is a thing which makes itself visible very soon. In case you have too much sulphuretted hydrogen in the gas, you see your wall paint stained, it smells of rotten eggs very strongly, and there are various tests which show it very clearly. If there is any great defect in illuminating power, of course you see that at once in the lack of light. All these things show that it is not so important that there should be an inspection of gas as of meters; but still it is important that there should be an inspection of gas. This inspection is necessarily more difficult and delicate than the inspection of meters, because it requires more scientific and chemical knowledge. The analysis of gas is one of the most intricate and delicate operations in the science of chemistry, and it requires a nice apparatus and a first-class scientific man to determine the purity and illuminating power of gas. It is a matter of more difficulty than the inspection of meters, and therefore, by the State law, the State Inspector alone is intrusted with it.

Now I will read the section in relation to the purity and illuminating powers of gas, and you will see if it is not a pretty stringent section.

Mr. NASH. I would like to ask one question. Why do they restrict the State Inspector from giving an opinion upon any meter that may be manufactured?

Mr. PUTNAM. I am very glad you ask the question. I endeavored to explain it the other night, but I am happy to answer the question again.

Mr. NASH. Was it not the manifest intention that no meter should supersede this? I have no question about it.

Mr. PUTNAM. I don't think any such inference can be drawn from the Act. The Act provides that "the Inspector shall not give certificates or written opinions to any maker or vendor of any meter." I say the object of that provision is obvious. I was not a member of the Legislature that passed the Act, and had nothing to do with it, and never studied the gas question at all until last winter; but I think any practical man would say that that is obviously a very proper clause to introduce there, in order to prevent the Gas Inspector either from becoming the corrupt instrument of some meter manufacturer, or being suspected of being so.

If the Gas Inspector were permitted to give his certificate that a meter was the best meter ever invented, or that this meter was better than that, it would be an object for a meter manufacturer to give a large sum for his certificate, and of course it would increase his pay handsomely. The State pay him three thousand dollars a year — an honorable, respectable salary; but a gas meter manufacturer who wished to introduce his meter here in Boston could afford to pay him thirty thousand dollars for his certificate.

Mr. STIMSON. The three thousand dollars include all the expenses of the office.

Mr. PUTNAM. I supposed the Inspector had the whole; he certainly should have it. But if his salary is less than three thousand dollars, there would be a still greater temptation for him to increase his emoluments by giving certificates. And what security could the public have that they had the best meter? The public generally could not have that entire confidence in the Inspector that those who know him have, and would suspect that they had the meter of the party who would pay him the most for his certificate. That would be the effect of having this clause stricken out. Either the Inspector would sell his certificate, and in that case we should not have the best meter, or else the public would suspect him of selling it.

Mr. NASH. If you had the assurance of a watch keeping time, wouldn't you buy it?

Mr. PUTNAM. That would depend upon who gave me the assurance. If I had the guaranty of the Messrs. Willard, I should have confidence in it; if I had the guaranty of some Peter Funk in Washington Street or in Broadway, I shouldn't feel it was any great advantage.

Mr. NASH. If you had the assurance of your own judgment?

Mr. PUTNAM. I should think it was a very good thing. But I am trying to make the Committee understand that the public would not have any confidence in a meter that was certified to by a public officer under such circumstances, knowing, as they must, the facility with which such certificates can be obtained, unless that public officer is of a higher character than people are willing to believe any man is whom they don't know. That was a reason, and a sufficient reason, for introducing that clause; whether there were other reasons or not, I don't know. That there was a purpose to retain any particular meter seems to me a suggestion that hardly calls for an answer. There is no record

of any such purpose. The law proposed by the Chairman leaves the question of the kind of meter to be used precisely where the present law leaves it.

But I was about to read to you the 10th section of the present law: —

"Sect. 10. Illuminating gas shall not be merchantable in this Commonwealth which has a minimum value of less than twelve candles; that is, a burner consuming five cubic feet per hour shall give a light as measured by the photometric apparatus in ordinary use of not less than twelve standard sperm candles, each consuming 120 grains per hour."

Now, I want to call your attention to the extreme stringency of that law. "*Illuminating gas shall not be merchantable in this Commonwealth which has a minimum value of less than twelve candles.*" I believe this is the only law in the world that has any such stringent provision as that. The English law provides that the minimum power of gas shall be twelve candles. That is the law which applies to the city of London, and this clause was copied from that law, so far as it establishes the standard of twelve candles. But this provision says (what is not in any other law) that "gas shall not be merchantable which has a minimum value of less than twelve candles." That is to say, if a Gas Company sell you gas of less than twelve candle power, you need not pay for it, or, if you have paid for it, you can recover your money.

Mr. NASH. The law, as originally drawn, read "fifteen candle power," but by the efforts of Mr. Greenough, it was reduced to twelve.

Mr. PUTNAM. Yes, sir, and very properly, too, as I shall endeavor to show. But the peculiarity of the provision to which I particularly call the attention of the Committee is the stringency of the clause which provides that gas below twelve candle power shall not be merchantable, and the protection which is thereby thrown round the citizen who uses the gas. The twelve candle standard was taken from the English law.

Mr. NASH. I beg your pardon, it is not so.

Mr. PUTNAM. I say, the standard of twelve candles is the same as the English law. I will read the section of the English law on that subject: —

"The quality of the gas supplied by any company shall be, as regards its illuminating power, such that an argand burner

having fifteen holes and a seven inch chimney, consuming five cubic feet of gas an hour, shall give a light *equal to the light of twelve sperm candles*, of six to the pound, each burning 120 grains an hour; and shall be, as regards its purity, free from ammonia, bisulphide of carbon, sulphuretted hydrogen, and other agents, deteriorating its quality or its illuminating capacity."

That is the section of the English law from which our standard was substantially taken.

Mr. HYDE. If you don't get ahead faster than you have, we shall not get any evidence to-night. I would propose that you state your points as briefly as possible, then let the witnesses be called, and then state the conclusions at which you arrive. I would also suggest that the questions asked of the witnesses be condensed as much as possible and get their statements in.

Mr. PUTNAM. I am glad you have made the suggestion, but I have carefully considered the matter, and I am satisfied that I shall save time by explaining the subject fully to the Committee, so that they will understand my view of the case; and then I shall not have to spend so much time with the witnesses, or so much time in argument. My experience in opening cases has led me to the conclusion, that when a matter is complicated, as this is, a full and even tedious opening is the best, on the whole.

Mr. NASH. I don't think there is any complication about it.

Mr. STEVENS. Mr. Putnam has been interrupted once or twice, and I don't think he has had a fair hearing.

Mr. PUTNAM. I make no complaint of the interruptions; still it is unusual to interfere with an opening in this manner. I am willing, however, to explain myself as I go along, but of course, the Committee must give me a longer time.

Mr. NASH. I beg the members of the Committee to understand that there is no counsel employed on the part of the city. I have not occupied five minutes.

Mr. PUTNAM. Not in your remarks, but it has been necessary for me to consume a good deal of time in answering your questions. I am very willing to do it, because it enables the Committee to understand the matter; but undoubtedly I should save time if I could go on without these digressions. I will go on as rapidly as I can.

I have already explained to you the first part of section 10. Then it goes on to say,

"Every gas is to be tested with the burner and under the pressure best adapted to it, and the result shall be calculated at a temperature of 60 degrees Fahrenheit."

A good deal of objection has been made to this provision, and it has been claimed that a standard burner, especially that the Liverpool standard burner, ought to be used as the test. There, I think, our law has the advantage of the English law. It was made later, and after the matter of gas chemistry was better understood than it was when the English law was made; and it is now perfectly well settled, and perfectly understood, that there is no such thing as a standard burner, to which every thing else ought to be conformed. Different kinds of gas burn best with different kinds of burners. One kind of gas burns best with one kind of burner, and another kind burns best with a different burner. You cannot test fairly the illuminating power of different kinds of gas by trying them all by one particular standard burner. And as for the Liverpool standard burner, there is no such thing known in this country.

Mr. NASH. I have one in my desk.

Mr. PUTNAM. Two or three have been imported by the Boston Gas Co., and one by the Chairman of this Committee; but with these exceptions, I don't believe there is a single Liverpool standard burner this side the Atlantic. You cannot buy one in any shop; it is not known; it is not used here; we use a different kind of burner. Now, the Gas Inspector does, as a matter of fact, use that Liverpool standard burner for testing illuminating power, because it is a convenient burner for him to use, and enables him to compare his results with the English results. It is a suitable burner, I believe, for our gas, but it is not the one our people use. But there is no doubt about this, that different kinds of gas require different burners, in order to burn their best.

Now, in order to explain this, it is necessary to go into the subject of light. You understand that all artificial light is produced by some body heated to a red or white heat; it is a solid body heated to a red or white heat. The most brilliant light known is the magnesium wire, which is heated to a white heat and beyond. Next to that, the most brilliant light is the electrical light, or, possibly, the light of a piece of chalk acted upon by an oxy-hydrogen blow-pipe; until lately, that was the most brilliant light known. All these are palpable cases of solid bodies heated to a white heat. But in the ordinary case of a light from gas, the solidity is

not seen, because the solid body consists of the impalpable dust of carbon. The moment it is liberated, or set free, the hydrogen sets fire to the carbon; this solid, impalpable dust is heated to a white heat, and that gives light. Now, a gas which is very rich in carbon will have comparatively little heat, and would give comparatively more light if the carbon could be all heated up. If there is more carbon in the gas than can be thoroughly heated by the hydrogen in the gas, then it will give a smoky light. In other words, if there is too much carbon, although you will have a very rich gas, it will smoke; it won't burn freely; it will approximate to the oil lamp. There is nothing so rich as the flame from the wick of an oil lamp, which is almost solid carbon, but the trouble is, you haven't got heat enough to bring all the carbon up to an incandescent state, which is necessary in order to give light. It is richer than any gas in the world. So that kind of gas is the best which has enough hydrogen in it to thoroughly heat all the carbon that is in it, without creating smoke, and that has carbon enough in it to give sufficient light.

Now, different kinds of coal make different qualities of gas — some are richer in carbon and some poorer; and these different degrees of richness require different kinds of burners. A gas that is very rich in carbon wants to be exposed as much as possible to atmospheric air, so that the carbon may get thoroughly burned. A gas that is poor in carbon wants to come out through large holes, and burn slowly, in order that the carbon in the gas may not be burned up too rapidly — may not be all consumed before it gets into the light part of the flame. You see, therefore, that it is obviously fair that different kinds of gas should be tested by different kinds of burners; and as throughout the Commonwealth, it is fairly to be supposed that the gas will be made from different materials, and in different ways, it is no more than fair and just that there should be some latitude; that it should be left to the Gas Inspector, who is a scientific man, and a man who understands his business, to determine what burner shall be used, according to the kind of coal that has been used in the manufacture of the gas. I don't think that was well understood at the time the English Act was passed; but it has become thoroughly understood by more recent investigations, and that provision was inserted in our Act, and indicates greater advance in science than the English Act does.

Mr. NASH. I would ask if you undertake to say that every kind

of gas cannot be tested by the Liverpool standard burner, made from any kind of coal, whether Cannel, Newcastle, or Pictou?

Mr. PUTNAM. Any kind of gas *can* be tested with any kind of burner.

Mr. NASH. But do you undertake to say that a very rich gas cannot be tested by this English burner?

Mr. PUTNAM. No, sir, I have said nothing of the kind. You misunderstand me.

Mr. NASH. If you are going to burn a gas of very rich quality — say a twenty-seven candle gas — you must use the bat-wing or fish-tail burner.

Mr. PUTNAM. I would say that any kind of gas *may* be tested by this Liverpool burner, but I say that no one burner is adapted to do justice to all kinds of gas.

Now, in point of fact, as I have said, in our Gas Inspector's office here they do use the Parliamentary standard burner, because they have got one, and it is convenient to compare their results with the results obtained in England. But this Parliamentary standard is entirely arbitrary; it was established simply because it happened to be in use in Liverpool; and our Legislature, much more wisely, left it to the Inspector to determine with what particular burner it was fairest to test each particular kind of gas. And although practically the test adopted is a fifteen hole argand burner, or something very similar, it would not be wise to require him to do it.

Mr. NASH. Do you infer there is any State test?

Mr. PUTNAM. The State requires that the gas shall be of at least twelve candle richness, tried with the burner best adapted to it.

Mr. NASH. Don't it depend very much upon what kind of gas you use, whether made from Cannel or Pictou coal, and when the test is made?

Mr. PUTNAM. Undoubtedly the material from which the gas is made affects the question very materially. Of course, you cannot get as rich gas out of Pictou coal as you can out of Cannel coal. Of course all Cannel gas will test a higher number of candles than Pictou gas. I have not said any thing that conflicts with that.

Now I won't attempt to explain to you the action of the photometer, except that it depends on a comparison, by the human eye, of the light of a candle with the light of gas. This comparison is aided by very ingenious mechanical contrivances, but still it de-

pends upon the human eye, and two eyes may differ half a candle or more in testing the same gas at the same time. But still the test is as accurate a one as can be made; and here there is ample provision in the present law for making it, and the restrictions are no more than proper.

The remainder of the section is the portion to which I wish to call your attention more particularly: —

"Whenever requested by the Mayor and Aldermen of any city, or the Selectmen of any town, the Inspector shall report to them whether the gas supplied in the respective city or town is of the legal standard, and also whether it is sufficiently well purified from sulphuretted hydrogen, ammonia, and carbonic acid."

That goes to the question of the purity of the gas. The three impurities by which gas is liable to be affected are sulphuretted hydrogen, ammonia, and carbonic acid. As sulphuretted hydrogen is offensive, you will notice its presence in the gas. Ammonia you will also notice; it has a pungent odor. Carbonic acid would to a certain extent deteriorate the gas, and tend to make the air impure; but still, it would take a very large quantity of carbonic acid to be really felt in a room in which gas is burning, because the combustion of the gas itself creates a large quantity of carbonic acid, in comparison with which that carried by the gas would be very slight. But still this test is required, to see that the gas is free from these impurities; and if the City Government wishes to have this test going on, the Inspector will test the gas every day. All you have got to do is to require him to make weekly or monthly reports, and he will be glad to do it. For a time after this office was created, these reports were made. Prof. Rogers and Mr. Stimson made their reports monthly for a year, but the Aldermen got tired of calling for them, and the practice was discontinued. All the City Government has got to do is to call for them, and they will be furnished again.

Mr. NASH. There was not an inspection for a year after the Inspector was appointed. It was found to be a farce to try to get a report.

Mr. PUTNAM. Now the only points in the proposed law that are not in the old law are in the seventh section of this bill. They relate to observations and reports in regard to pressure, which are entirely unnecessary, and would be simply a waste of time, because you can have an automatic register and pressure indicator in every police station in the city if you choose. The average con-

sumption by the street burners I undertake to say it is impracticable to test from day to day. The only way to test it is by taking off a burner, and seeing how much that burner consumes: and then it is not necessarily subject to the same pressure to which it is subject in the street lamp. In the street lamp, the burner is subject to a pressure which may be affected by the amount of gas that is being burned in the neighboring streets, by temperature, and by a thousand other causes, which do not affect the burner when tested in the Inspector's office. Consequently, an inspection of the average consumption of the street burners is something entirely impracticable, from day to day, unless you have a meter attached to each burner, and then you don't need any such inspection. But the only way to be sure how much a street lamp burns is to have a meter attached to it. The order now is to put on burners which burn five cubic feet an hour. These burners are tested before they are put on the street lamps at a pressure of two inches which is supposed to be the average. They are supposed to burn five feet an hour, under a two-inch pressure, and are tested for that. When they get on the street lamps, they probably burn more than that, because the pressure is usually more than two inches. But the amount of their consumption cannot be accurately taken from day to day, as is called for by the proposed bill; it is entirely impracticable. As for the idea of getting up a new act in order that the Inspector may publish information for the benefit of the citizens, I will not comment upon that now.

The great feature of this new bill, and the serious objection to it, is its call for the sixteen candle standard. A sixteen candle minimum standard is something hitherto entirely unknown, and it is unreasonable. You cannot have that without running up sometimes as high as 25 or 30 candles; and in order to do that, you have got to use very rich coal, and make your gas very expensive, and you have got to make it so thick that it will clog up your pipes and burners and make trouble. Sixteen is a fair average, and it is rather below the average of the actual illuminating power of the gas. But the gas which will average 16 candles will sometimes run down to 14½, and sometimes run up to 19, according to the temperature; but to call for a minimum of 16 candles, under all circumstances, would be to make an unreasonable requirement, and to call for a gas which is more expensive than people care to burn, and for a gas, too, which would not so well answer the ordinary requirements of the people.

You will consider in this connection our condition with regard to coal. England is a great coal field. The gas manufacturers there get their coal close to their doors. It costs them comparatively nothing. Here we have no coal fit for gas-making purposes nearer than Nova Scotia. There is no coal this side the Alleghanies on this continent, except the small supply in the Albert vein, in Nova Scotia, which will make a 16 candle minimum gas; nothing but Cannel coal will do it. We have to import all our material either from England or Nova Scotia, and of course the bulk of our supply must be got from bituminous coal; but that coal will not furnish a gas which shall not, whether in cold weather or warm, go below 16 candles; it will vary from 14 to 17 candles, which is about the quality of gas best adapted for all practical purposes — neither too thick nor too thin, but burning freely, and without smoke. The gas called for by this proposed bill is a kind of gas you don't want. You would have a maximum gas which is too heavy, too smoky, and too expensive.

Mr. NASH. How is it that they require 20 candle gas in England?

Mr. PUTNAM. I have not seen any such law.

Mr. NASH. I have. It is the 23d Victoria, chap. 125, passed Aug. 28, 1860.

Mr. PUTNAM. I will look at it by and by, and comment upon it at the proper time.

Prof. ROGERS. Let me explain that, as there seems to be some confusion in regard to it, and I have had occasion to look into it very recently. The point is this. There are two qualities of gas referred to in the Act relating to the city of London — common coal gas and Cannel coal gas. The common coal gas is required to have an illuminating power of not less than twelve candles; the Cannel gas an illuminating power of not less than twenty candles. There is that distinction made between the two kinds of gas.

But I would beg to point to another consideration, which seems to have been overlooked, in reference to the use of the Parliamentary burner. The Parliamentary burner, the 15 hole argand burner, — which is a very vague description, inasmuch as the size of the holes was never fixed until a comparatively late period, — the 15 hole argand burner was required to be used exclusively for testing the illuminating power of the common gas; but the 15 hole Parliamentary burner is utterly unsuited to test the illuminating power of the Cannel gas, and accordingly the Act does not require the

Cannel gas to be tested by the Parliamentary burner at all, but by a bat-wing or fish-tail burner. The difference is so very striking that it amounts to fifty per cent. If you take the Cannel gas, with which I made some experiments when in Scotland a year and a half ago, and consume it in a Parliamentary burner, and then compare the illuminating power of a cubic foot with the illuminating power of a cubic foot when consumed in a large bat-wing burner, the advantage in favor of the bat-wing burner is about 56 per cent. Of course, therefore, it would be perfectly absurd to require that the illuminating power of this very rich gas, — 25 and even 30 candle power, — should be tested by the Parliamentary burner. It has happened very unfortunately in the organization of the British law on this subject, that no distinction was made between the different kinds of gas burners required by particular qualities of gas. Nothing has been more distinctly ascertained by the experiments that have been made by gas engineers on the continent of Europe, in Great Britain, and by ourselves in this country, than this: that in order to obtain the full illuminating power of gas of a special quality, you must use a particular kind of burner; and you must not only define the number of holes, but the size of the holes and the height of the chimney. Hence, therefore, "the Parliamentary burner" is not enough to say in reference to testing common coal gas, and you will see, by referring to the English law which has been read by Mr. Putnam, that it is stated that the gas is to burn at the rate of five cubic feet an hour, in an argand burner, with a chimney seven inches high. If you were allowed to use any kind of chimney you pleased, you might modify, in a very great degree, the amount of light you obtained from the same quantity of gas, under the same pressure, and in the same burner. You are therefore required to be very specific, if you are to determine with any thing like precision the illuminating power of your gas. If you want to go down to thirteen candles, it will make a difference of one candle whether you use a seven or an eight inch chimney — it may make a difference of two candles. It is, therefore, a matter of absolute necessity that you be very specific in regard to the instrument you employ. To give an instance. According to a great multitude of experiments, a thirteen candle gas, such as is usually burned in the city of London, when consumed in an argand burner, gives you an illuminating power equal to thirteen candles. But consume that gas in a bat-wing burner, and it gives you only nine candles.

Five cubic feet of gas consumed in a fish-tail or bat-wing burner, will give you an amount of light measured only by nine candles; and that same quantity, burned in an argand burner, according to the Parliamentary standard, with a seven inch chimney, will give you an illuminating power equal to thirteen candles. It is, therefore, absolutely necessary, if you are going to make any law upon this subject, to specify something of the particular instrument you are going to use in burning your gas. You can get an immense diversity of illuminating power, from the same amount of gas, simply by modifying the instrument through which it is burned — the number and size of the holes, the form of the chimney, and all the other circumstances connected with it.

Mr. NASH. The English law fixes that. It provides that the burner shall be an argand burner, with fifteen holes, and a seven inch chimney.

Prof. ROGERS. I know that, but the size of the holes is not fixed, and that makes a difference.

Mr. NASH. I know the size of the holes makes a difference; but the drill that is used to make the holes in these Parliamentary burners is the same, and never has varied.

Prof. ROGERS. It has been very much varied.

Mr. NASH. It has not varied, unless for the purpose of deception. The English law fixes it.

Prof. ROGERS. The English law originally said nothing about the diameter of the holes, and each maker had his own fancy about it. One man thought the burner would be a little better if the holes were larger, and he enlarged them; another thought it would be better to have the holes smaller, and he made them smaller. But more recently, I believe, they have determined upon the precise size of the holes. I would merely remark in that connection, therefore, that so far as the establishment of the inspection in the State of Massachusetts is concerned, it really was in advance in regard to knowledge of the science of gas lighting, and a good deal in advance of the English Parliamentary law.

Mr. NASH. In the provision that every gas company, in every city and town, might test their gas by any burner they saw fit to use?

Prof. ROGERS. The *Inspector* may use whatever burner he sees fit.

Mr. HYDE. If an argand burner be given, the height of the chimney given, the number of holes given, and the amount con-

sumed per hour given, would the size of the holes make any difference?

Prof. ROGERS. Oh, yes, it would make a material difference, because, if a certain number of cubic feet — say five — are required to be delivered from the apertures of the burner, (which is of course required in this process of inspection, for the illuminating power of each hole is very restricted,) the gas is compelled to pass out with very great facility, in order that the requisite quantity shall be delivered. If the holes are small, the gas passes out with much less facility than if they are large. Now, the amount of light given by each jet will depend somewhat upon the amount of gas given out per second or minute into the air, and upon the velocity with which it is delivered. You can have a jet of gas running with such velocity that it gives you hardly any thing but a blue light. Now, to show you the operation of the bat-wing and fish-tail burners, I will mention this fact, which is a very striking one. If you take a thirteen candle gas and burn it in an argand burner, you get the illuminating power of thirteen candles; if you burn the same quantity of gas in a bat-wing or fish-tail burner, you get only the illuminating power of nine candles. But if you put two bat-wing burners together, so as to have an agglomeration of the flame,—not so large an expansion compared with the quantity of the flame,—you get an illuminating power very nearly equal to twice thirteen. In other words, each one of these bat-wing burners, when the two flames are united into one, gives you very nearly as much illuminating power as an argand; showing that the real fact is, that the flame of a thin jet of gas, greatly exposed to the atmosphere on both sides, loses its power of illumination simply because there is such a large extent of atmosphere on both sides of this thin jet of escaping gas. This is thoroughly mixed up with the gas, and causes it to burn with a blue flame. Sometimes one-half or two-thirds of the whole area of the flame is blue. If you turn through a jet of gas a stream of atmospheric air, you will get a strong heat, but the illuminating power of the gas is gone. You have an enormous heat, which will melt platinum wire, but you have no light. So it is also where you have a jet of gas escaping from a burner, under conditions in which there will be a large amount of atmospheric air mixing with the gas.

I would remark, in regard to the gas of the city of London, that there are three great manufactories there — the "Great Cen-

tral Gas Works," the "Chartered," and the "City Gas Works"—three of the largest establishments of the kind in the world. These companies furnish a gas averaging, so far as its illuminating power is concerned, from thirteen to fourteen candles. They run down to twelve, the Parliamentary limit, and sometimes below twelve; but in the main, they may be considered as ranging between twelve and fourteen and a half. That is their common gas, and that is the only gas which is tested by the Parliamentary burner. Sometimes they get up to fourteen and a half.

Mr. NASH. The gas the nobility and wealthy classes burn is the Cannel gas, is it not?

Prof. ROGERS. No, sir: there are difficulties in the way. Cannel gas cannot be burned in an argand burner, or in any thing but a fish-tail or bat-wing burner, which are not considered so elegant or agreeable, perhaps. They are obliged to burn it in small flames. I found that in Glasgow, where they burn from twenty to twenty-five candle gas, they used burners which furnished only two or three feet per hour, instead of five feet, as with us.

Mr. NASH. They get as much light from that amount of gas as we get from five feet.

Prof. ROGERS. Probably quite as much in some cases, but it will depend entirely upon circumstances. You have a small, reddish, ruddy flame with Cannel gas. But the point is this: that in Scotland, where these rich gases are used, the coal that is used is Cannel coal, which furnishes a gas of from twenty to thirty candle power, and there are extensive beds of that kind of coal found in several parts of Scotland, and coal is comparatively cheap there, and the manufacture of gas is attended with comparatively little difficulty. I found, where I was residing, in the neighborhood of Scotland, that the Cannel gas that was burned was not satisfactory to my eyes; probably because I had been used to a more voluminous and whiter light. They don't dare to use larger burners, and let more gas on, because it would instantly smoke, and become exceedingly offensive.

Mr. NASH. What was the pressure?

Prof. ROGERS. About an inch and a half.

Mr. NASH. Suppose they had reduced it?

Prof. ROGERS. They can reduce it down to half an inch, if they want to. By an arrangement of the stop-cock, anybody can reduce it at his own pleasure.

I would say to the gentlemen present, in regard to this whole

subject, that it is not at all an easy class of questions that you have to deal with here. The whole subject of gas composition and gas analysis, the determination of its illuminating power, and all these considerations, are complicated questions: they require a great deal of scientific knowledge to understand them thoroughly. The determination of the illuminating power of gas is a simple thing; the determination, by chemical tests, of the quality of gas, is not to be considered a difficult matter; but the determination of the character of the burners best suited to the different kinds of gas is a very complicated question. We talk about the distinction between Cannel gas and common gas; — there is no precise line of distinction to be drawn between them. There is an immense variety in common coal gas, and a very great variety in Cannel gas. There is a gradation of one into the other.

Mr. GREENOUGH. How low a grade of Cannel gas did you ever see?

Prof. ROGERS. I never saw any thing lower than from twenty to twenty-two candles.

Mr. GREENOUGH. You never saw any thing of the Barton Hill gas?

Prof. ROGERS. No; my examination was not extensive. In Edinburgh, where they use the Barton Hill gas, I was told that they run down to sixteen and seventeen. That is a poor Cannel coal. But I doubt the statement. In Glasgow, I asked the man at the Gas Works how high they ran up, and he said up to thirty-five candle power. I asked him how he determined the quality. "By the photometer." "Will you allow me to see your arrangements for measuring the gas?" "Certainly," he said. He took me into a little closet, in which he had a dirty instrument, with which no one could pretend to come within thirty per cent.

Mr. GREENOUGH. Was that the old Co.?

Prof. ROGERS. The old company. Of course I asked him if that was the only instrument used to determine photometrically the quality of their gas, and he said, "Oh, we never use it." "How do you test your gas, then?" "Well, by the eye. I know pretty near how much light the gas is giving."

It is a very unfortunate thing, and is so understood by the gas engineers of Great Britain generally, that that distinction was made in the Parliamentary law between Cannel coal gas and other gas, and for this reason: that almost universally throughout England, and the same is true in this country, the burners, whether

bat-wing, fish-tail, or argand, are so arranged as to give you about a twelve candle illumination, because you don't burn your argand up to its full power, as you would in making your experiments in the photometer room; and I suppose it has been found best, for ordinary uses, to have each one of these little foci of light have about an average value of twelve candles, and it is therefore that, whether Cannel gas or common gas is used, the matter is always so arranged that the particular light which is to be substituted for the candle shall have an illuminating power of about twelve candles. Now, it would have been a great deal wiser in England, and would be a great deal wiser in this country, if we have a law here on the subject, to put it in this way: that no argand burner, consuming five cubic feet per hour of common gas, shall have a less illuminating power than twelve candles; and that a bat-wing burner, consuming a certain amount — not five feet, but a certain amount — of Cannel gas, shall also have an illuminating power of not less than twelve candles. Let twelve candles be the minimum power to be used, and then specify how many cubic feet are necessary to give you twelve candle power. Then you have a perfectly uniform system prevailing everywhere, by which a comparison can be made, instead of putting it in this vague way, that you are to have a twenty candle power when you burn Cannel gas, and you are to have a twelve candle power when you are burning your ordinary gas, — and saying nothing of the kind of burner you are to use.

Mr. Hyde. Saying nothing of the expense, which really gives the best light, the Cannel gas or the common gas?

Prof. Rogers. Well, every one has to judge for himself.

Mr. Hyde. I mean, under the ordinary circumstances and for the ordinary purposes of life.

Prof. Rogers. Here is perhaps the view I should take of it. Suppose you have placed in two adjoining rooms, or in one room, two flames: one is a flame of common gas, with twelve candle power, and the other a flame of Cannel gas, with twelve candle power. Your question is, which of these would be most useful, without regard to expense? You have a twelve candle power in both of them. Now, what does that mean? It means, that the illuminating power is precisely the same. If there is any meaning to the phrase, it is that each of them is equivalent to twelve sperm candles. Therefore we must admit, by the very definition, that so far as their light-giving power is concerned, they are

equal. Then the only difference is in the quality of the light. Some persons like the light from Cannel gas the best; some like the whiter light of the common gas better. I am fond of the white light. I don't like the yellowish lights, tending to smoke — they are not agreeable to me. The mixture of red rays is rather offensive to me; yet I have seen quite a number of persons who prefer that light.

Mr. PUTNAM. Judging from what you have seen, should you think that people here, who are accustomed to this whiter light, would prefer to substitute the other kind of light?

Prof. ROGERS. I don't know how that would be. I don't regard the light here as a perfectly white light. If you compare it with the light of the Philadelphia gas, it is not so white a light; but if you compare the candle power of the two gases, there is a very great difference. Philadelphia gas is rarely beyond a fourteen candle power.

Mr. PUTNAM. There are one or two specific questions that I wish to put to you, while you are upon that point. I will ask you how the illuminating power of Boston gas compares with that of other cities in this country and in Europe with which you are familiar?

Prof. ROGERS. I am not prepared to say, from any extensive knowledge. I can speak pretty positively of Baltimore, Philadelphia, and New York. I think the New York gas, in candle power, is about the same as Boston gas, varying from fifteen up to twenty candle power, but generally ranging about sixteen, seventeen or eighteen. Then in regard to the Philadelphia gas, the tests I have made of that have given it a low power. There is a great deal of very light gaseous matter mixed with it. They mix a great deal of wet gas with it.

Mr. PUTNAM. I meant to have you take into consideration not only the illuminating power but the purity of the gas.

Prof. ROGERS. I am not prepared to say, except from some little analysis. I think the gas of New York is very well purified; that of Philadelphia is very badly purified. On the only occasion when I happened to examine it, I found it very impure.

Mr. PUTNAM. How does our gas compare, in point of purity, with the English gas?

Prof. ROGERS. I don't know what it is now.

Mr. PUTNAM. I mean, in your experience.

Prof. ROGERS. I used to compare from week to week, or month

to month, the observations that were made in the office of inspection with the results of Letheby and others at London, Manchester and Birmingham, and I found our gas, as a general thing, as well purified as theirs. There was a time when it had more carbonic acid than the English gas, but that was a temporary matter. In regard to ammonia and sulphuretted hydrogen, it has been generally quite well purified. I think I mentioned in one report that I made to the Mayor and Aldermen that I had found more ammonia and more sulphuretted hydrogen in the gas than it ought to have in it.

Mr. PUTNAM. That is a thing that is likely to arise from accident occasionally, and cannot be avoided.

Prof. ROGERS. I should think so. My attention has lately been turned to this matter, by some chemical investigations I was making, and I happened to be looking over the observations of Letheby in reference to the grade of gas in England, and I saw the results of an examination for three months. They showed an average, at the beginning, of fourteen candle power, which was cut down rapidly to twelve, and that the quantity of sulphur present in the gas amounted to a great deal over the Parliamentary limit, which is twenty grains to the hundred cubic feet. There were as many as twenty-eight grains in one case. And that was the average for the entire three months, which was certainly foul gas.

Mr. GREENOUGH. You never found any thing like that in our gas?

Prof. ROGERS. Oh, no, sir: 11 $\frac{16}{100}$ for the 100 cubic feet. I think, on the whole, there can be no reasonable fault found in that respect. Accidents are liable to happen in regard to these matters.

Mr. PUTNAM. Now I wish to ask in regard to the provision of our law which provides that in testing the illuminating power of gas, that kind of burner shall be used which is best adapted to it. Is not that, on the whole, in your opinion, a wise way to leave the matter at present? Is it not wise to leave it to the discretion of the Inspector how each particular gas shall be inspected?

Prof. ROGERS. I think it is. If the requisition should be made, under these circumstances, that the Parliamentary burner should be used for the purpose of testing all gas, it would place it out of the power of parties to furnish a gas that would give an average of sixteen candle power. I don't see what alternative there would be, unless you got some mode for bringing down the

candle power to the English standard of twelve candles. It would very much discourage, it seems to me, the manufacture of rich gas.

Mr. NASH. How can that be, if the English gas is from 27 to 30 candle power?

Prof. ROGERS. Just imagine the Parliamentary burner required in England as the standard for all their gas — what would they do? They would say, "We won't make any of this Cannel gas; we will make common gas, because the Parliamentary burner does justice to common gas, but the Parliamentary burner is fifty per cent wrong in reference to Cannel gas, in some cases. Therefore, we will give up the manufacture of this rich gas entirely, and turn our attention to the manufacture of the poorer gas exclusively. We have a proper standard for testing the value of that gas, for common gas really receives justice at the hands of that Parliamentary burner." I say, I believe if there was a general law of that kind, it would greatly discourage the introduction and use of the higher and richer gases. The English saw that very clearly, and therefore they did not require the Parliamentary burner to be used in testing these rich gases, knowing that it would be impracticable, and would probably entirely throw out of use these rich gases; but they said, "These rich gases must be tested by a burner that suits them;" that is, the bat-wing burner.

Mr. PUTNAM. If that is so, would it not be perfectly impossible to have a minimum of sixteen candles, to be tested by the Parliamentary standard, because you can't get a minimum sixteen candle power out of bituminous coal, you say, and the Parliamentary standard is not fit to test Cannel coal gas.

Prof. ROGERS. You don't understand me. You can test Cannel gas with the Parliamentary burner; that is to say, you can make an experiment in your photometric room. But testing does not mean making experiments. You can use the Parliamentary burner and register Cannel gas, and burn, after a fashion, a twenty candle gas, but when you come to make an experiment under these circumstances, you have a very smoky flame if you burn five feet an hour.

Mr. NASH. Will it show a twenty candle power?

Prof. ROGERS. No, sir, nothing like that. I think a gas of sixteen candle power can be burned in a Parliamentary burner.

Mr. PUTNAM. I am talking about a gas which has a *minimum*

of sixteen candles, and must of course *range* a great deal higher. For such a gas, would that Parliamentary burner be a reasonable test?

Prof. ROGERS. It would not be the best test, undoubtedly. When you come down to a range of 15, 16 or even 17 candle power, you are very fairly within the limits of a just application of the Parliamentary burner. But when you run up to 20 or 25, if you make a really rich Cannel gas, then you find that the Parliamentary burner won't answer.

Mr. PUTNAM. If you have a gas which is restricted by law to a minimum of 16 candles, must not that gas, in order to be sure to keep up to that minimum, run up at times to 20 and 25?

Prof. ROGERS. It might; but that is allowing a wide range. [Referring to the tables of the Inspector, the Prof. stated that the range was from 16 to 22.]

Mr. HYDE. That is not the ordinary range?

Prof. ROGERS. No, sir: the average is $17\frac{67}{100}$.

Mr. HYDE. I understood you to say, that in burning the rich Cannel gases, twelve candle power was the best degree of light.

Prof. ROGERS. Yes, sir, for the common distributed light. I suppose every one is aware of the fact, that the pleasantness and agreeableness of an illumination depends greatly upon its diffusion. Nobody likes to have a very intense glare of light as the centre of illumination in a room where he is sitting, and this standard seems to have been the result, unconsciously, of some general experience. The same thing is true, to a great extent, on the continent of Europe. All seem to have come, by a curious coincidence, to this mass of light, of about twelve candle power, as the proper degree of illumination, for ordinary purposes.

Mr. PUTNAM. Then that is the proper minimum?

Prof. ROGERS. I should think so. If Cannel gas is used, then, while the minimum of that gas is fixed also, it ought to be stated how many cubic feet go to produce that. If, for example, Cannel gas is to be the subject of special legislation, then at the same time that you state that the burner (specifying it) should produce an illumination equal to twelve candles, it ought to be said, an illumination due to the consumption of so many cubic feet of gas per hour — just as you say that the twelve candle power of the argand burner is due to the consumption of five cubic feet per hour. You cannot require five feet of Cannel gas to be burned in an

argand burner per hour, because it would make the room so very offensive with smoke that it would be impossible to live in it.

Mr. HYDE. What would be the amount of Cannel gas consumed in a bat-wing burner, compared with the consumption of the other gas in an argand?

Prof. ROGERS. It would depend, of course, upon the richness of the gas. Cannel gas sometimes runs up to thirty candle power; it fluctuates through a very wide range. It might run from two to four cubic feet per hour. A very weak Cannel gas at certain times would require four cubic feet, to give what five cubic feet of common gas would give. Then with some gas of extraordinary richness, which requires your flame to be pinched to a very small size to prevent smoking, two cubic feet would be as much as would be required.

Mr. HYDE. [?] What is the comparative expense of the production of the two gases? Say, for instance, Cannel gas from Incehall coal, producing about four and a half cubic feet of gas to the pound of coal.

Mr. GREENOUGH. Well, we are of course under an extraordinary condition of things now. That coal has cost lately thirty dollars per ton. You see very readily how much that gas would cost per thousand cubic feet. I suppose Pictou coal, which for the last two years has cost an average of about nine dollars a ton, would produce three and a quarter feet of gas to the pound. For four or five years, we have used here Pictou, Newcastle, and Albert coal, in combination. The Albert coal is the richest Cannel coal known in the world. It has cost, upon an average for the last two years, not far from $25.00 a ton. That would probably go as far as two and a half or three tons of Incehall coal. I have given the elements of the calculation, and you can make the figures if you like.

Mr. PUTNAM. Now I want to ask you whether you consider this standard which is proposed to be a wise and reasonable standard to be introduced into our law as the minimum standard?

Prof. ROGERS. I think it is too high — simply for the reason that I mentioned. I see from my own reports, that generally this gas runs up to 16, and beyond 16, but there are occasions when it runs down to 14 and a fraction. 14.41, 17.60 — 14 to 18.47 — so it goes. I think with any thing short of Cannel gas, or gas made from coal containing a very considerable portion of Cannel coal, it would be impossible to come up to that standard, or above

that standard, uniformly. You would have to run down to 15, and even below 15.

Mr. NASH. I don't understand why they fix the standard at 20 in England if that is the case.

Prof. ROGERS. Let me tell you, that is gas made of nothing but Cannel coal.

Mr. NASH. That is what we are talking about.

Prof. ROGERS. You want a gas made of Cannel coal?

Mr. NASH. Certainly we do. We don't want what they make only for manufacturing purposes, and the poorer class of people.

Prof. ROGERS. I look at it in this view. The gas which is manufactured here is not properly Cannel coal gas, and never has been. The material which is used is bituminous coal, which has been mixed with more or less Cannel coal — Boghead and Albert coal. Now, if there is to be a revolution in the manufacture of gas, if the manufacture of Cannel coal gas only is to be required, and that is to be the subject of a special law, then you may put up your standard, if you choose, to twenty candles. But it would not be so easy to conform to it in this country as in England, because of the exceeding coldness of our winters, which would reduce the quality of the gas. One of the circumstances which should be kept in mind is the condensable properties of some of this gas. Seven or eight per cent of the whole bulk of the richest Cannel coal does not contain more than seven or eight per cent of matter that produces any light at all. It is like volatilized wax or fat (and it contains a great deal of naphtha, and there is greater liability to combustion than with common gas); so that when you have very cold weather, you must necessarily expect very considerable and sometimes very alarming effects from the illuminating power of your gas. That is one of the disadvantages that would result from undertaking to run up to a higher standard of gas under the circumstances in which we are placed.

Mr. PUTNAM. Would it be reasonable and wise, in this Commonwealth, and considering our position here, to require Cannel gas to be furnished?

Prof. ROGERS. If Cannel gas is required, then of course a very great additional expense will be involved. Of course, if gentlemen desire to burn Cannel gas, or any thing still more expensive than that, and are ready to pay the great additional cost, they can have it.

Mr. PUTNAM. Would it be reasonable or wise for the Common-

wealth to require of the gas companies to furnish Cannel gas, considering our situation, and the accessibility of bituminous coal, and the inaccessibility of Cannel coal?

Prof. ROGERS. If I were consulted about it, I should hesitate very much, simply on this ground: because I know the expense of Cannel coal is now and will continue to be very great, and it would be absolutely impossible to manufacture Cannel gas without a very large additional expense to the community. Of course they would have to pay very much more per thousand feet, but it would be richer in illuminating power. Yet such is the expensiveness of Cannel coal, that it is a question whether they would not have to pay, for the same amount of light, a larger sum than they do now. Of course the whole apparatus would have to be changed. These ordinary burners would not answer the purpose.

Mr. NASH. All gas is poorer in Winter than in Summer.

Prof. ROGERS. All gas is liable to be, to some extent; but there is a great deal of difference in that respect. You know that hardly anything is more condensable than this atmospheric air which is impregnated with gasoline. It gives a light very much indeed like the light of Cannel coal gas — very much the same tint. If the apparatus is kept at a proper temperature, it serves out atmospheric air in a very rich condition for illumination; but if the temperature falls down to or below 32 degs., the gas goes out, or becomes so very weak as to burn blue, simply because this very rich vapor does not remain gas at all. At a temperature of 32, it is a liquid. You know that water is a gas if you heat it to the boiling point. If we had no temperature below the boiling point, we should never know water at all; we should call it gas.

Mr. NASH. If you burn a poor gas, to get the same illuminating power that is furnished by a rich gas, you must burn more of it, musn't you?

Prof. ROGERS. Yes, sir; and I would remark that a gas which has a poor illuminating power compared with Cannel gas, will suffer comparatively little, if it is a respectably good gas, from fluctuations of temperature, simply because it owes its illuminating power almost entirely to such an excess of gases that are not capable of being condensed into liquids unless you go very far below the freezing point.

Mr. PUTNAM. So that, in a very cold climate, the common gases are much less objectionable than Cannel coal gas?

Prof. ROGERS. I think so, if they are properly purified. There

is this point about it, that ought to be kept in view in fixing your lower limit. It is very desirable that we should have, if possible, a uniformly good, strong gas. All of us agree to that. A gas of from 16 to 17 candle power as an average is really looked upon, all the world over, as a very fair gas; and it has this advantage, that it is not subject to those very great fluctuations that I have referred to, like the richer gases. You may have a Cannel gas that gives 20, 25, or even more candle power; but then you must expect a very great diminution, sometimes amounting to one-half the illuminating power, in very intense winter weather, and of course there will be very serious public inconvenience arising from it. It appears to me that really the wisest arrangement in regard to furnishing gas, taking into account every thing, — the economy to the public, the comparative uniformity in the production of light, — is not to aim at one of these very high gases, but to aim at a gas having a range of from 16 to 18 candles. If you aim at that range, you must expect the gas will run down, it may be, to 14, and now and then up to 20; but if you have a gas that will average an illuminating power of 16 or 17 candles, it is a very desirable quality of gas for ordinary purposes.

Mr. Nash. If there is so much variation as that, why should you not use the richest material and make the richest gas? If you have a rich gas, you burn it under a light pressure; if you have a poor gas, you burn it under a heavy pressure.

Prof. Rogers. The point I make is simply this. Suppose we had now distributed in Boston what we call a 25 candle gas, if we lived at New Orleans, we should not have much difficulty with it; but there is always an inconvenience in great fluctuations in the illuminating power of gas. For public buildings and for private buildings, it is desirable to have something like a steady flow of gas. Now, if you use these very fat gases, you are liable, when the temperature is reduced very much, as it is liable to be in our winters, to a very considerable reduction in the power of the gas.

Mr. Nash. Notwithstanding that, is not the community very much benefited by the use of this rich gas? Is it not more healthy? After being in a room lighted with gas for a time, I notice a very dry heat, and a pressure of blood upon the brain.

Prof. Rogers. Well, I think I can enlighten you upon the chemistry of that subject. The difference between these very rich gases, such as Cannel gas, and a medium quality of poorer gas, is this: that the richer gases contain a larger quantity of

carbon, which when burned will give you, for a cubic foot of gas, a very much larger quantity of carbonic acid than a cubic foot of common gas; and for this reason, that the carbon is the great illuminating power. You speak of one kind of gas giving a dry air, and the other not. I will point out the difference in that respect. It is the other way. These low gases, such as they burn in London — 13 and 14 candle power gases — contain a great amount of hydrogen gas, and a great amount of carburetted hydrogen of the light kind, producing little or no illumination. Now, it is the hydrogen which, when burned, produces water, and the more hydrogen there is in a gas, the moister the air that is produced in the room where the gas is burned. Unless, therefore, you burn the same amount of Cannel gas that you do of the common gas, you get a great deal more moisture in the air from the common gas than you do from the other. So far, then, from getting a dryer air, you get a moister air.

Mr. NASH. But you are not obliged to burn so much of the Cannel gas as of the other to get the same amount of light.

Prof. ROGERS. Let me explain that. I see you don't exactly take the idea. Suppose that two feet of Cannel gas are equal to five cubic feet of common gas. If you burn five cubic feet of common gas, you will generate a very large amount of water. If you burn five cubic feet of Cannel gas, you will not generate half so much steam; but you are only burning two feet, and therefore you fall short still more of the quantity of water produced by the common gas, and consequently produce a much more moist condition of the air when burning the common gas than when using the richer gases. This is a very simple question of chemistry.

Mr. NASH. I feel the effects of the dry air, in the pressure of blood upon the brain.

Prof. ROGERS. I don't think that arises from want of moisture. It may be really the effect of steam. You may find yourself steamed a little on such occasions.

Mr. NASH [exhibiting a burner]. Here is a burner that I sent to England for, and obtained as a specimen of the regular Liverpool burner.

Prof. ROGERS. That is the regular 15 hole argand burner,— such an one as I bought at Wright's. When I was in London, about 18 months ago, I went into a large inspection establishment, in which they had all the arrangements for testing gas, and I

found that they used two or three different kinds of burners. I asked them which kind they preferred, and they said, according to their notion, it didn't make much difference.

Mr. NASH. I saw last fall, that the price of gas in Liverpool was fixed at ninety cents a thousand cubic feet. How can they afford it at that, when here the price is nearly four times as much?

Prof. ROGERS. I really don't know. I hardly paid any attention to that question when I was there. You know, of course, that Liverpool is immediately adjoining the great Lancashire coal fields.

Mr. NASH. Yes, sir: but we can get at what coal costs there.

Mr. PUTNAM. You were the first inspector appointed under the law?

Prof. ROGERS. Yes, sir.

Mr. PUTNAM. I wish to ask you what impression was made upon your mind in the course of your inspection of gas, of the fairness with which the public were treated by the gas companies, and particularly the Boston gas companies?

Prof. ROGERS. I must say, that I entered upon the inspection with the feeling that I was somewhat set as a watchman in behalf of the public, and was to look pretty sharply at the quality of the gas and its illuminating power; but though I did find, in various parts of the State, now and then, gas companies that were falling short in the quality of their gas, and sometimes falling short in the illuminating power required, yet I never found any difficulty, after making known the fact to the persons concerned in the production of the gas. The impression with which I left the office was, that they were quite as honest, quite as well-intentioned, and quite as much governed by the principles of rectitude and regard for the public, as any other persons in the community who have a commodity to manufacture and to sell. I know nothing more, and can say nothing further about it.

At this point, the hearing was suspended, and the Committee retired for private consultation. After some little time, they returned, and the Chairman stated that they had come to the conclusion that it would be impossible to conclude the investigation in season to propose any action to the Legislature at its present session, and had therefore determined to open the whole subject, —including the question of the manufacture of gas by the city,—

with the view of presenting the matter to the attention of the Legislature at its next session.

The Committee then adjourned, with the understanding that the parties would be notified of any subsequent hearing.

GAS MANUFACTURE AND SUPPLY.

The Committee of the two branches of the City Government having this matter under consideration, met at the Council Chamber on Monday evening, Nov. 19, to resume the hearings suspended in the Spring. At 7½ o'clock, the Chairman of the Committee, Alderman Nash, called the Committee to order, and read the orders under which they were acting. He then said—

We commenced this hearing last Spring, and proceeded, as you will remember, with two examinations, when finding that it was going to be so protracted that we should not have time to reach the Legislature upon the subject at that session, it was decided by the Committee to postpone the hearing until Fall, when people would be in town, and the members better able to attend, and we should then be able to report and reach the Legislature at its next session. We are now ready to resume the consideration of the subject. At the time of the postponement of the hearing, parties in the interest of the Boston Gas Light Companies had been heard. Whether they have had all the hearing they desire, and have no one present here to-night to be heard, we do not know. The companies employed counsel at the two hearings last Spring; the city had none.

The city now has counsel, Mr. Stackpole, who is present, and if he pleases he may proceed to open the matter at the present time, and we will decide how we shall proceed afterwards.

Mr. STACKPOLE. I will go on, if the Committee desire it, and state what matters I propose to lay before the Committee shortly, and then go on and call my witnesses, if that course of procedure is desired by the Committee.

The CHAIRMAN. Are any gentlemen present representing the Gas Companies, and if so, for whom do they appear?

C. P. CURTIS, Esq. I appear here for the Boston Gas Light Co., in conjunction with Mr. Jewell.

The CHAIRMAN. Are any of the other companies represented here? The South Boston or East Boston Company?

GEO. PUTNAM, Jr., Esq. I represent the South Boston Gas Co., sir.

The CHAIRMAN. Is there any one present who represents the East Boston Co.? [There was no response to this inquiry.]

It is proposed by the Committee that we commence *de novo* in this matter to-night; that Mr. Stackpole open the subject, and then proceed in examination of witnesses, who will be questioned and cross-questioned on both sides; and all proper questions that are put to the representatives of the different companies here will be answered.

Mr. CURTIS. I would like to say a single word. As this hearing, according to a notice in the papers, seems to take rather a wider range than the subjects that were laid before the Committee in the Spring, and as the notice that was published in the papers seems to be rather sweeping in its nature, and is apparently directed chiefly against the Boston Gas Light Company, we desire to say that we do not wish to avoid any investigation upon any subject; we rather court it than otherwise, feeling perfectly confident that we shall be able to answer every charge that is brought against us; but for the sake of shortening this hearing, which apparently, from the broad field that is opened, is not likely to be of the shortest description, we should like to have some little specification or statement of what the counsel for the Committee (I do not know whether the Counsel represents the city or not) proposes to lay before the Committee, so that between now and the next meeting we may be prepared to come here and refute any charges that may be brought against the Company. It seems to us to be hardly expedient that the Counsel for the other side should be empowered to go *ad libitum* into all the subjects that may be brought to the attention of the Committee under this notice, without any opening statement or specification of what he proposes to show. We do not wish to limit the examination; but we suppose that there are some subjects connected with this matter of the manufacture of Gas which may be considered settled. One of those subjects, for instance, is the locality of the gas works. It would appear from the city documents already on file in the archives of the city, that this subject has been repeatedly inves-

tigated, and that the best of opinions have been given, by city physicians and others, upon it; and really it would seem that a conclusion once come to upon that subject, based upon the best advice attainable, ought to be final. It would hardly seem to be expedient to re-open that subject at this late day, when the Committee, by an examination of the printed documents, will find that it has been gone over again and again. Still, as I said before, if we can have some statement of what we are to answer, we shall be ready to do it.

Mr. STACKPOLE. I do not understand that the city are precluded from re-investigating any subject they please here; and if I understand the order you have just read, Mr. Chairman, it expressly mentions the matter to which the gentleman refers as a matter for investigation; and in my judgment it is perfectly proper for the Committee to do it, in common with all the other questions connected with the subject. They are not precluded from making the investigation as broad as possible.

With regard to the suggestion that I should make a statement of the points I intend to present here, I was about to state, in substance, the matters I propose to lay before the Committee; but as the questions are very broad, I do not think it would be possible in any opening, without detaining the Committee too long a time, to go into them with any minuteness.

The CHAIRMAN. I will state that the Committee, in taking up this subject, took it up as a matter in which the citizens are interested, and in proceeding with it, they never anticipated that there would be any hearing asked by the Gas Company, or that they would be called upon to go into the examination of the question any further than we should into any subject where the City Government was sitting in Committee to investigate and report upon an important matter like that which we are now considering. The past action of the City Government, and the opinions which have been given in regard to the gas companies, are not binding upon us. We know that in Europe, they are removing the Gas Manufactories from their cities, at an immense expense, and we know that light and knowledge in regard to sanitary matters have been vastly increased within a few years, and that it is a question absorbing the attention of the ablest minds of our large cities to a very great extent, and the facts that can be developed now in relation to the whole subject are different in their nature from those which were developed when other investigations have been

made by the City Government. I believe that Napoleon has caused the gas works to be removed from the city of Paris, and that in London they have it in contemplation, or have already done so, to petition Parliament for the removal of the gas works from the city of London, which would involve great expense, from sanitary considerations. The same considerations which apply there would apply here; and when we proceed, as a Committee of the City Government, to investigate a question of this nature, we ask the citizens who live in the vicinity of the gas factory to come up and testify to us what they deem to be the deleterious effects of the gas works in their neighborhood, and also the depreciating effect upon the value of their real estate of the presence of those works in that section of the city. The Committee view it in that light — that it is legitimate for them to go into that subject; and that view will govern the Committee's action. They are investigating a subject upon which they feel obligated to throw all the light they possibly can, and I believe it is the unanimous opinion of the Committee that this is a proper subject for us to consider.

In regard to the gas companies represented here, we have no objection to hearing what they haye to say upon the subject, and hence we have given them a hearing of two nights, and intend to give them a proper hearing through to the end. I think it is legitimate that we should investigate the whole subject, in its sanitary bearings, as well as in regard to the economical supply of gas, and also in regard to the mode of measurement, inspection, &c.

Mr. JEWELL. I have to say, on behalf of the Boston Gas Co., which I represent in part, with my friend here (Mr. Curtis), that they have not the slightest objection to any investigation that the City Government chooses to make into their affairs; they never have had, they have not now, and they never will have. They are perfectly confident, and have been during these last years, that the management of their Company, the quality of their gas, the price at which it is sold, the purity of the gas, and the effect of their works upon the health of the citizens, will bear the fullest examination and scrutiny. In fact, Mr. Chairman, the Boston Gas Light Co. are not only willing to have this investigation made, except for the trouble it occasions and the time it occupies (and that is very little), but they are desirous that it should be made. I will say this: there is no subject, probably, upon which there is more misconception in the minds of people than this subject of

gas, and in every investigation of this kind, the gas company think their management will be proved so good, the quality of their gas so good, and their price so reasonable, that it will tend to disabuse the public mind of the misconceptions with respect to this matter.

All I have to say is, that while we do not wish to restrict the investigation, the question of the location of the gas works, as suggested by my friend, is one that affects us considerably, because, as you know, this question was considered in 1853 or 1854 with great fulness. I recollect it, because I was counsel against the Gas Company in the hearing that resulted in the stoppage of their works on Mason Street, and shortly after, there was an attempt made to have the works removed from where they are now. A very full hearing took place, eminent counsel were employed on both sides (for the matter was brought on a petition from citizens, and the Gas Company appeared as remonstrants), and the Committee reported against the petition, both for the removal of the gasometer at the South End and of the gas works in Commercial Street, where they now are; and the reason why we contend that that question ought not be raised here is because we have gone on and made very large expenditures of money, acting upon the faith that the city then, in substance, granted us the right to retain that location; so that, in our case, it would be a greater hardship to be obliged to remove the works now than it would have been then.

As to the other subjects which this order embraces, the chairman will see that the order seems to be a call upon the citizens to come here and make complaints against the Gas Company. We desire to have these complaints clearly stated before the Committee. We are willing and desirous to have every one of these complaints investigated, and all we ask of the Committee is, that they shall have patience to listen to us while we show the want of foundation, if we may, — as we are sure we can, — of all the complaints that may be made against the Gas Company. That is exactly the position in which we stand here; and therefore all I desire to say now is, that whatever complaints are made or developed by Mr. Stackpole or by the witnesses here against the Company, we desire to have them minuted, so that we can take them up one by one; and we ask the Committee to have patience and permit us to show the answer to every one, from beginning to end.

OPENING STATEMENT OF J. L. STACKPOLE, Esq.

I think the gentleman will find that the Committee will listen to him at the proper time, and that he will have a very full opportunity to answer whatever is brought up against him. I now propose, as was suggested by the Chairman, to go on and state very briefly the chief heads of the matter which I design to present.

I need not speak of the importance of the subject, for if it were not a very important subject, we should not be here to-night. But I must say this: that I have reflected a good deal upon the subject, and spent a great deal of time in looking at it in different ways, and the more I have looked at it, the more I have been impressed with its importance, and the more I have been impressed with the necessity of some reform in our existing laws and in the conduct of the Gas Companies in this Commonwealth, and in Boston, the largest city, in particular. It is easy, on looking back at the history of gas companies, to see that gas, especially in its distribution and supply, is really now in its infancy.

In the beginning, the manufacture of this article for the citizens was naturally taken up by corporations, like the manufacture of goods, or any other article requiring a large amount of capital, for which there was a demand among the citizens. It was not then so universally employed as it is now, and it was not taken by the poorer classes; but to-day, gas has become with us almost as much a necessity as water. Its pipes run through our streets in the same way as our water-pipes; it is regarded by the citizens generally as a necessity; and it does not follow that because in the infancy of gas distribution and gas supply, certain private corporations were allowed to take the matter up, when the thing gets older and becomes more advanced, this condition of things is to continue to all time. At one time, as I have said, gas was not an article generally used; now it is used by every one. Now, on account of the monopoly which the supply of gas necessarily allows the gas company, and on account of the large number of people taking it, it is necessary, in my judgment, that the most particular legislation be made on the subject, in order to regulate the private gas companies, if they are to be continued, or, if those gas companies are to be discontinued, and the public, the citizens, that is to say, the city, are to undertake the supply, they should take it

into their own hands and supply it to the citizens at the minimum cost, in order that the whole number of citizens may not support and give an excessive profit to one particular class, who happen to be suppliers, in the form of a corporation.

I have taken some pains to ascertain the amount of capital now making the stock of the various gas corporations in this country, and I find it to be fifty-five millions of dollars. This stock is almost all above par, and held throughout the country by rich and influential citizens, some of them making portions of the city government or town government, and the gas is supplied by these corporations to the citizens at a very high and excessive price. There are 400 cities and towns that use it; containing some 7,500,000 people. Some patient calculator, sir, has, I understand, made a calculation, by which he estimates that the gas made in a year would fill a gas holder 680 acres in extent, and 330 feet high; and now people throughout the land are beginning to think on this subject. This investigation is not confined to Boston alone. Similar investigations are going on all over the country. They are going on, or have been going on, in England, which has taken the advance. We are not alone in this matter. Prices are excessive all over this country; and this movement here to-night and the action of the Committee are simply a part of what is going on to-day all over the country. This movement is, I think, going on in Cincinnati, Detroit, and St. Louis. Philadelphia makes its own gas. In New York, the subject has been very much agitated. By a recent act of the Ohio Legislature, the city of Cincinnati has been allowed to purchase from the gas company there, the gas works, at an expense of $2,500,000, and the city are about issuing bonds to that amount for the purpose of paying for those works. In the course of their investigations, it happened that they went to Pittsburg, where they understood that gas was supplied at a proper rate to the citizens, that there was no excessive profit gained by the corporation. And there it turns out, gentlemen, that they had made, up to the 30th of last June, 107,000,000 feet of gas, at a cost of 91½ cents per thousand feet; whereas we are now supplied with gas at $3.25 a thousand feet. Now I am perfectly willing to admit that coal is more easily and cheaply got at Pittsburg than it is here, but certainly, taking all the elements into comparison, there is no such difference between the two places as to make this enormous difference. I have understood that the Committee of the City Government of Cincinnati

have calculated that out there, where the price of coal is higher, and where certainly labor is as high as it is here, it would not cost them more than twenty-five cents more per thousand feet to manufacture their gas; and they are about doing so, as I understand it. Now in regard to this Boston Gas Light Company, I think it does not need any very shrewd observer to see, by looking at the price of their stock in the market, what the prosperity of the corporation is, and what profits they are making. The present company was commenced in 1826, by parties who purchased the charter and property of the old concern, and in 1835 a company was established with a capital of $75.000. This was increased to $175,000 in 1836, I think, and up to $250,000 in 1837. In 1852, an increase of $500,000 was granted, making an authorized capital of a million, on which only $800,000 has been paid in. From 1826 to 1835, the property was in the hands of a few individuals, and no dividends were paid. Since then it has been a regular ten per cent stock, the dividend being usually paid in March and September. In 1861, however, they began a system of quarterly dividends, paying two and a half per cent a quarter. The par of this stock, as I understand (and I believe there is no doubt about it), is $500, and it now sells in the market for about $750, or fifty per cent advance. Besides those increases of capital to which I have referred, in 1864, I am instructed, the capital was increased $250,000, making the present capital $1,250,000. Now in addition to the regular dividend of 10 per cent, — certainly a very handsome profit, — it must be understood that this increase of stock is always followed by a profit to the stockholders, and is, in fact, only another way of making further dividends, and not putting the thing quite so palpably before the eyes of the citizens. For instance, in 1864, they made an extra dividend, giving each man holding four shares of the old stock the right to take one of the new at par. That is to say, they were allowed to take a $500 stock at par, which was worth in the market $750 — which they could go into the market and sell the next day, and make $250, or $300, for I believe it was rather higher at that time. The right to each new share sold in the market at from $60 to $62, — say $60, — which was really an extra dividend of 12 per cent; so that in 1864, the stockholders got a dividend of 22 per cent. I do not know whether the previous increase of capital was made in this way or not; I have not been able to find that out; probably we shall learn whether it was or not before we

get on much further. But that is the system that is going on. They do not content themselves with this handsome profit, but they constantly make new stock and pay further dividends. With this statement with regard to the stock, I don't think it needs any very shrewd man to judge whether this company is in a prosperous state, or whether it is making a very large profit or not. I suppose that to be generally conceded. The question is now whether every citizen who uses the gas is to be compelled to contribute to this large profit, or whether we are to regulate those profits, so that the company shall be paid a fair compensation, or take the matter into our own hands, and conduct it in a fair way, supplying the citizens with gas at a proper price.

This subject opens a very wide range of investigation, and I should not wish to take up the time of the Committee by going into the minutiæ of each particular point, but I would suggest a few of the broader topics, and have a word to say under each one of them. I have divided the subject in this way: First, Gas. Second, Quality. Third, Distribution. Fourth, Measurement. Fifth, Relation of Producer and Consumer. Sixth, Position of the Works. And here, perhaps, it may be well to state how far legislation has gone, in order that the Committee may understand just where we stand, so far as that is concerned.

By the statute of 1861, chap. 108, certain provisions were made. They are somewhat verbose, covering three pages in the supplement to the General Statues, but the effect is no more than this: That there shall be an inspector of meters appointed, who shall inspect old meters at the request of parties, who shall inspect new meters when they are put up, and in that way shall do something to regulate the meters in the town. It is also provided that he shall test the gas in a certain way (on which I propose to comment) at the request of the city, town, or village government. This is, in few words, what the bill amounts to. I do not say any more about it, because I propose, as I go along with the topics that I purpose to illustrate, to state what I think are the imperfections of the bill, and what need there is for improvement. It appeared to me, after a good deal of reflection on the matter, that the prime thing at the foundation of all this question, and the one that constantly presented itself, was the matter of price or cost. You will see that in this act there is not one word said in reference to regulating the charge which a company may make for their gas. Now, with this monopoly, and with no

regulation of the price that may be charged, if you restrict them in one way and make them a little more careful, they may come out and say, "We shall have to charge twenty-five, ten, or five cents per thousand feet more for it." If you tell them that their gas is not sufficiently clear, that it is not sufficiently strong, that it does not represent enough candles, you do not really effect any thing, because the whole object of this movement is to cheapen the gas, and they may charge more, they will charge more; so that it strikes me, and I think it must strike every person, on reflection, that no measure to cheapen gas and produce any permanent reform in this matter will be available, unless there is some restriction, in some ordinance of the city or statute of the Commonwealth, to the charge that may be made. The English statute on this subject is very full indeed, and I propose to ask permission of the Committee to read it to them. It is the 40th section of the Metropolis Gas Act.

"No company shall advance the price of gas above the rate taken by such company on the first day of January, 1860, whenever such rate is at or above four shillings and sixpence per one thousand cubic feet, unless there has been such increase in the cost of gas, or any other circumstances affecting the company as will warrant such advance: provided always, that before raising the gas rate in any district, the gas company supplying such district shall give notice of their intention to the local authorities of the district and in some newspaper circulating within the district for two consecutive weeks at least one month before such alteration in the gas rate shall be made; and in case any local authority shall, within such month, dissent from such alteration, it shall be determined by arbitration in the manner hereinbefore mentioned whether such alteration shall be allowed; provided always that no gas company shall charge for common gas supplied by them any sum exceeding five shillings and sixpence for every one thousand cubic feet, or for Cannel gas any sum exceeding seven shillings and sixpence for every one thousand cubic feet; provided also, that any company shall be at liberty to change the kind of gas from time to time supplied by such company, whether Common or Cannel gas, on giving three months' notice of their intention so to do; and upon the expiration of such notice, the company shall thenceforth supply gas pursuant thereto, under the provisions of this act, until any like notice shall be given for a further change; and when the company shall change the supply

from Cannel Gas to Common Gas, the rate shall be reduced so as not to exceed four shillings and sixpence per thousand cubic feet, except under the circumstances and in the manner hereinbefore set forth."

This statute seems to me a very proper one, and I think we should have one analogous to it in certain particulars.

The price in this city, as I have said before, is $3.25 a foot. I think I shall be able to show you, by competent experts, that that price is excessive. I think any one who will go into a calculation on the subject will find it excessive; that $2.50 would be an ample price for any company which should start now, buy land and put up buildings at the present increased rate of land and buildings; whereas, this company have got every thing there, which they have paid for at lower rates, and which have been paid for, I do not know how many times over, by the profits they have made, which certainly ought to be taken into account in considering this matter. In my judgment, it is no answer to say that Boston is supplied with gas as cheaply as any other city in the country, because I contend that this is an epoch in which the gas companies throughout the country have come up to that pitch of price that further legislation is needed; and to say that Boston is supplied as cheaply as this city or that city is no answer to it. Looking back to the history of the supply of gas in Boston, we find that up to 1857, Cannel gas, of a minimum of 22 candles (I believe it sometimes went rather less, but that was through some error, that did not continue), — Cannel gas made from a superior kind of coal, and a superior kind of gas, was supplied at the rate of $2.00 per thousand feet. It appears from the statement of the profits made by the company that certainly they did not lose any thing at this rate. Now they charge $3.25 for Pictou gas, the minimum being twelve candles. Is there any reason for this change? We think there is not. I think I should state that it will appear that there are few places in this country where gas can be supplied, owing to several circumstances, so cheaply as it can be in Boston. The principal reason is the compactness of Boston. In Philadelphia, you might have to make your pipes twenty or thirty miles long, while here in Boston we are all together; the population is very close; it is a small city, in the amount of ground covered; it is not a straggling city, and the expense of laying pipes, one of the largest expenses, is very small in comparison with some other cities. In the second place, if

coal is not so high in New York as here, the secondary products, such as coke and tar, which are produced in the manufacture of gas, sell at a higher price here than there. And in regard to the number of people supplied, which is an important element in the manufacture of gas, for, as the Committee will readily see, the larger the number supplied, the cheaper the gas company can supply them,—in regard to the number of people supplied, we have now reached nearly as large a number as the average of the four companies which supply New-York city, consequently the number of people in New York does not affect the question so as to make the gas cheaper there for that reason. Moreover, the late scientific improvements in the manufacture of gas have tended to cheapen it. If the price of coal and iron has gone up, other things have had their effect in the opposite direction. Furnaces are now made in such a manner that a much larger proportion of the residuary products, the coke and tar, is preserved than before; pipes and fixtures are made much better, so that the element of leakage, which I suppose, at first, and twenty years ago, even, embraced a large proportion of the gas made, is almost nothing now; and the hundred different improvements in the manufacture which have resulted from the advancement of science, and which I need not now particularize, have all conspired together to cheapen the expense of making gas, and diminish the effect resulting from the advance in coal and iron.

Of course it will be for the Committee to consider what means are to be taken to reduce the price; how they are to oblige the companies, if the companies are to continue to supply the citizens, to bring down their price; whether by requiring returns to be made, according to the English system, or by the appointment of Committee to judge of the matter and dictate the price of gas, in a reasonable way, or whether the price is to be established by legislation in the State House or here, or whether the city is to take the thing into their own hands, and manufacture the gas themselves. These are all matters that will have to be debated.

I come now to the quality of the gas. I have already stated what the quality was and is. The minimum is twelve candle gas. The Committee already understand, as it was debated at the last hearing how far better Cannel gas is than Pictou gas. Cannel gas burns from 22 to 25, 30, and even more candles; the other gas gives from 12 to 20. We think we shall show you, by the testimony of persons conversant with it, that it will be better for

all parties to use this Cannel gas; that it gives a larger amount of light, where a large amount is desirable; that it is better for the private house; that it can be turned down more easily; that it can be better economized; that it gives a clearer light; that it can be distributed through the pipes in a much smaller quantity, because it represents a larger amount of light; that it is more easily distributed, and also, that there is less pressure required to force it through the pipes. I do not propose to go into the particulars of that, but leave it to the Committee.

Now, how shall we find out whether we get this quantity which is allowed us? How does the statute stand upon this point? It seems to me that it is very defective. Here is a large amount of gas being constantly made and furnished to the citizens, and it would seem that it was the duty of the government to require that this gas should be constantly examined; that proper inspectors should be appointed to examine this gas morning and night, and that we should watch and see that we get the right quality of gas. But there is not a word in the statute about that. The only way in which the gas is examined is upon the complaint of some high official; but the ordinary people using the gas don't think it worth while to go up and make a row about it. They only know they have to pay so much, and their gas is poor. But if we are going to legislate for these people, we ought to protect them. It is no answer to say that they do not come forward and complain. In London there are people who examine the gas and make reports and tables, and in that way the citizens know what they are burning, while we do not.

Now, what is the system adopted to find out whether the gas comes up to this low standard? It is very peculiar certainly, and it is very difficult to find out what it means. Each gas is to be tested with the burner and under the pressure best adapted to it, and the result shall be calculated at a temperature of 60 degs. Farenheit; not tested as the citizens use it, not tested with the burner that is used through the town, but they give it the most favorable circumstances, the pressure best adapted to it, and the burner best adapted to it; and then, if they can bring it up to twelve candles, they say it is all right. Now, I submit that this provision is not fair; that the quality of the gas should be tested by the burner ordinarily used among the citizens, and then they will get their twelve candle gas, or they will see that it is not less; that some standard should be fixed in that way, and that it should be

taken at the average pressure, and not at the pressure best adapted to it. The object is, not to test what the gas may be, under the most favorable conditions, but it is to test what is burned through the city. It seems to me that this law is extremely defective in this particular. The English law on this subject is, I think, perhaps worth referring to: —

"The quality of the common gas supplied by any gas company shall be, with respect to its illuminating power at a distance as near as may be of one thousand yards from the works, such as to produce from an argand burner having fifteen holes and a seven inch chimney, consuming five cubic feet of gas an hour, a light equal in intensity to the light produced by not less than twelve sperm candles of six to the pound, each burning one hundred and twenty grains an hour; and the quality of Cannel gas supplied by any gas company shall with respect to its illuminating power at the distance aforesaid be such as to produce from a bat's-wing or fish-tail burner consuming five feet of gas per hour a light equal in intensity to twenty such sperm candles, and each such gas shall with respect to its purity be so far free from ammonia and sulphuretted hydrogen that it shall not discolor either turmeric paper or paper imbued with acetate or carbonate of lead, when those tests are exposed to a current of gas issuing for one minute under a pressure of five-tenths of an inch of water, and shall not contain more than twenty grains of sulphur in any form in one hundred cubic feet of gas: provided, that any gas company, and the local authorities of the district supplied by such company, shall be at liberty to agree upon any other or different test by which to ascertain the purity of the gas, or to vary the amount of ammonia or sulphur in any form hereinbefore allowed, and thereupon the company shall be thenceforth liable to have the purity of their gas tested in the manner so prescribed."

To pass to the subject of distribution, I think the Committee should inquire very carefully in regard to whether the pipes which are now laid down in these streets are large enough to supply the citizens at the proper pressure. The Committee are undoubtedly aware, that the amount of gas used depends a great deal upon the pressure, and we find upon investigation of the matter, that the pressure we have here is much too large; and I believe one reason of that is, that the Gas Company are obliged to have too strong a pressure on the gas pipes in order to drive their gas through the city; and that results from the fact that the gas pipes are not

large enough. I think also something may be found in the fact that the gas goes in and out of the holders at the same time. Any one will easily understand the pressure that is caused, who goes out in the evening and leaves the gas burning with a small flame. If he comes back after the majority of the lights are put out, say at twelve o'clock, he will find that the pressure has increased so much that his gas is burning twice if not three times as much as he intended. And I think, in regard to the city lights in particular, there is much need of having the pressure regulated, so that when there is little gas used in the city, the pressure shall be no more than when there is a large amount.

In regard to the measurement of gas, the question in relation to dry meters and wet meters was much discussed at the previous hearing; I therefore do not think it necessary for me to detain the Committee in explaining the different meters. Mr. Putnam, who appeared for the South Boston Co., explained very clearly, and I believe correctly, as far as I can tell by examining the minutes, the different classes of meters. Whether or not his conclusions were correct is another matter. It is not necessary for me to go into that question at present. I think, however, there is a serious defect in this statute, which requires alteration, in the fact that it permits to remain in the houses of the citizens of Boston a large number of meters which have been used for a long time, which have never been examined, and which are probably measuring to-day very inaccurately, and, as they are dry meters, probably against the consumer, on account of the hardening of the leather. I think there certainly should be some amendment made, providing that the gas inspector of the city or State should go through the city, and see that every meter was right, and see that it was stamped. It should not be left for individuals to come forward, at the chance of having to pay the expense themselves, to find out whether their meters are right. I think that every gas meter should have on it the stamp of the city, and that some provision should be made by the city for the inspection of these gas meters, in order to prevent their deterioration, either monthly or annually, or at such times as persons of scientific information think it necessary.

In regard to the relations between the consumer and the manufacturer, I have also an objection to make to the law, and it lies in this: that according to that statute, if a person refuses to pay his gas-bill, no matter for what reason, the company have the right to

go into his house and cut off his gas. He has no chance to be heard. It is a peremptory matter, a one-sided thing; the company which is one of the parties, determines against the rights of the other. In the English statute, about which I talk a great deal, because I think it shows a great deal of care, and I have read the minutes of the committee which brought in the bill, and certainly they took the testimony at very great length, and examined gentlemen of the greatest capacity and highest scientific attainments in England on the matter, and I regard the bill as a very excellent one, — in this statute, the person is authorized to go before a magistrate; there is some one to say — "You cannot inconvenience the person; he may be in suffering; he may be sick; he may have a perfectly good case." By our statute, the company may come in and cut off the gas without the consumer being allowed to say nay. It seems to me wrong that these companies, being as it were, the servants of the city, should be allowed to come in and so conduct towards really one of their own employers.

In regard to the position of the gas works, which Mr. Jewell has spoken about, the questions to be presented are palpable. We think we can satisfy the Committee that gas works can be instituted as cheaply, and more cheaply, out of town; that the effect upon the citizens, in the quarter where the gas is manufactured, is deleterious; that the effect on real estate is to diminish it; and that in our little crowded city, the population of which is crowded out in every direction, where every foot of space is valuable, and where it should be tenanted by some of the most necessary things, whether men or manufactures, or whatever it may be, we certainly, as a matter of economy should not allow these large corporations to buy out the citizens, and take possession of a large portion of the city, and not only expel by their act the citizens, whom they really drive out, but diminish the value of property all around them, so that other citizens are ready to say, "Our property is becoming worthless, and we had better sell out to the Gas Company as soon as we can." It seems to me there is no end to that thing.

Having considered all these questions it will then be incumbent for the Committee, as it seems to me, to consider whether or not the Gas Companies shall be restricted within their proper bounds and be allowed to go on, and supply gas to the city; or, if they do not take that course, whether they will not take it upon themselves to construct works out of town and supply the citizens at the minimum cost. I think the testimony will show that the City

Government could do that; that they probably could borrow money on an excellent loan and put down these pipes and supply the city. I do not know whether it would be well for the city simply to supply their own light; in my judgment, it will be better to take the whole or none.

I think I have been over all the points that I said I should; and I may say, in answer to Mr. Jewell's suggestion, that I do not think the City Government have any desire to infringe the rights of this company. I think they want to treat them fairly — I am sure of it. I think they want to give them the fullest opportunity to be heard, as I understand they have. I think they want to bring every thing up fairly and squarely, giving them every right; and I think it will be fully shown that their present rate of charge is excessive, and that the citizens have a right to put it down. And if I am told that this is a large corporation, and that there are many people interested in it who occupy high places, I say it is the duty of the Committee, if they are satisfied that they are right, and feel that they are representing the city and the welfare of its people, to have this matter regulated by proper legislation. If the Committee are satisfied with regard to these things, as I think they will be, and they then proceed to secure this matter by an ordinance of the city or legislation by the State, they will be supported by the citizens whose rights they are protecting, and they will be able to secure for them a proper supply of gas, and at proper rates.

Mr. Stackpole then proceeded to introduce his testimony, calling first Dr. A. A. Hayes.

TESTIMONY OF DR. A. A. HAYES.

Q. (by Mr. Stackpole). What office do you hold now?

A. I am in the office of State Assayer.

Q. You reside in the City of Boston?

A. I reside in the City of Boston.

Q. Have you given any attention to the subject of the manufacture of gas for illuminating purposes?

A. I have in former years; not very recently.

Q. Have you, by reading or otherwise, studied the subject of gas distribution by pipes?

A. I have, by reading, sir.

Q. Did your study of the subject lead you to observe the management of works in this country and abroad?

A. The study of gas manufacture in general has led me to examine the works in this country and abroad.

Q. Will you state to what extent?

A. I was at one time connected with the Boston Gas Light Company. I think for about three years. The observations, made there, were daily observations, or nearly so. I have also examined carefully the gas manufactories of the city of New York at different times, and there I have made experiments on the production of gas, testing its value — its illuminating power. I have visited other cities of the United States, — Philadelphia, Baltimore, Richmond, New Orleans, — and observed the manufacture of gas in those places; I have examined the manufacture of gas by the Great Western Gas Company, in London, where for seven days I made experiments with the engineer of the works; and I have seen the manufactories in Liverpool and other places.

Q. What was your connection with the Boston Gas Light Company?

A. I was their consulting chemist.

Q. Between what years?

A. I think from 1854 to 1857. I think about three years. I have no very precise recollection of the time.

Q. Are you informed on the subject of gas distribution from works in the suburbs, outside of city limits?

A. I have examined works of that character.

Q. Whereabouts?

A. The Philadelphia Gas Works. I don't know but the city may now include them, but they were for a time outside the city limits. The Great Western Gas Company's Works were outside of the population of London, and I think outside of the city limits, at Kensal Green. I mention these works, because they were most ably conducted. The engineer in charge was perhaps the highest authority in London on such subjects.

Q. What was his name?

A. Wright.

Q. What are the most prominent obstacles to the establishment of works outside of city limits?

A. It is considered, generally, that the cost of transmitting the gas manufactured, the increased length of main-pipe, or larger pipe required, is the greater obstacle.

Q. Will you state how great that obstacle is, in your judgment?

A. It adds very much to the investment, as the size and length of the main pipes of distribution are increased. There are exact data given by the Philadelphia Company, and I should prefer to refer to those for accuracy of information.

Q. Are there any other obstacles, in your judgment?

A. None that are important. I am supposing that the position, chosen outside the city, is as accessible by water-borne cargoes of coal and other materials required, and that the site is chosen with reference to the business to be carried on, such as the building of the cisterns for gas-holders, &c.

Q. In your opinion, Doctor, would the lower cost of the land, the increased space secured, the smaller cost of subsisting the workmen, and the comfort of the workmen, counterbalance these obstacles? Will you please enter into details upon these points?

A. I am not prepared to give you any very accurate estimates upon those points. I can only generally state that, as is very well known, manufactures outside the city, excepting in a few cases, can be conducted more economically than within the city limits. This is a special business, requiring the employment of large capital,—very close, accurate supervision, and a trained body of workmen,—men who are skilled in the production of gas. The general feature of cost would perhaps be nearly the same outside the city limits, as within; that includes the main pipe distribution, or the mains from the gas-holders where the gas is stored; on the other side, we should have the diminished cost of the land, the subsistence of the workmen would be less, the character of the work people, which is a very important element in this manufacture, would be higher, as work people, and the works generally would be under better control. These are, briefly, the points;—and I can refer the Committee with great pleasure to the reports of the Philadelphia works, and the other published accounts.

Q. In regard to the price of the land and site?

A. I stated that the price would be very much less of the land occupied, which would allow all the engineering plans to be carried out in the suburbs better than in any confined space in the city. I might state, in this connection, that in the first establishment of gas works, they are generally in the suburbs, strictly, if not without the city limits. The city grows to them; and in many cases, the gas works then are removed. That has

been the case in large cities, — the largest in the world; and you see it in some of the smaller ones.

Q. In regard to the subsistence of the workmen, — the rent of their houses, their food?

A. Subsistence would be very much less out of the city than in, for that class of persons.

Q. Would the establishment of gas works outside of the city limits be deemed by you an extraordinary undertaking?

A. Not extraordinary; there are many cases of that kind.

Q. Do any others occur to you besides those you have stated before?

A. The gas works of Paris were removed. There is not now, in the city of Paris, any establishment for the manufacture of gas. The removal of the gas works in Philadelphia was deemed an economical measure, and was proceeded with to the removal of the entire works, I believe. The works in New York, with a single exception, were erected in the suburbs at first. These have remained nearly in the position where they were first placed, but the population has advanced to them and beyond them. But other works have been established still further off, and now wait for the population to advance to them. The two large establishments are now quite centrally situated, from the expansion of the population.

Q. Do you know any thing in regard to the Southern and Western cities?

A. I think it is generally the case, that they were established early in the suburbs, but in most of the cities, the population has spread up to, or nearly to, the gas works.

Q. In your judgment, could a manufactory, or works, established outside the city limits, be constructed as economically, with regard to making the gas, as in the city?

A. They could, certainly, in my opinion.

Q. Do you know of any experience in regard to the manufacture of gas outside the city limits?

A. I have referred to that in Philadelphia. I think a little search would bring several other cases to light. I ought to state, that I have been absent from the city, and have not had a moment's time to prepare answers for any questions here, — and I therefore cannot go into details. It would need a little preparation.

Q. In the event of works being established without the city

limits, would there exist a necessity for the erection of gas-holders at proper points within the city?

A. No, sir; there would be no demand for the erection of any gas-holders within the city proper. There are other engineering devices which enable the mechanical management of the gas to be carried on without the building of gas-holders in different parts of the city. I think it is not practised generally.

Q. In London, do you know how it is?

A. In London, the larger bulk of the gas is stored at the works. I do not recollect a single case where there are outlying gasometers, unless they were early erections, and the premises are maintained after the population has grown up to them. The Great Western Gas Works, at Kensal Green, are certainly a very good case in point. At the time I saw them, they were manufacturing Cannel gas, which was transmitted over four miles before their pipe was tapped at all.

Q. How is it at Philadelphia?

A. I don't know the distance they transmit before the pipe is opened. However that may be at the moment, of course, as the population advances, as gas is required, the distance is shortened.

Q. Could the gas for consumption be stored at the same point, and all under the same supervision?

A. Yes, sir, — and it is more economical to do that.

Q. Would it not be desirable to do so?

A. I think that would be the decision in regard to the point, by those acquainted with the subject.

Q. What would be the advantages?

A. The erections would then be on one simple system, and the vast quantity of gas in the Company's large work would be under the supervision of persons immediately connected with the works. The machinery which is employed in storing the gas and in passing it from store-house to store-house, so as to supply it to the different parts of the city, being of a somewhat delicate mechanical construction, would be under the supervision of the proper persons; the gas and the apparatus used about it would be safer in case of any internal disorder; or even in guarding against malicious acts of persons, it would be far better that it should be stored near the point of production.

Q. Are there any objections in regard to the storage of gas in a densely populated city on sanitary grounds?

A. I think that question involves the matter of care. Where

the gas-holders, as they are technically termed, are placed within the buildings and enclosed, and those buildings secured and watched, the gas escaping from the gas-holder (if it escapes at all) passes to so high a point as not to be within the reach of the breathing part of the population. It passes out and diffuses in the atmosphere; and I do not think there can be any objection, on sanitary grounds, to storing gas in that way.

Q. Any risk of explosion?

A. Gas does not explode by itself. It explodes only after it has been mixed with atmospheric air in certain proportions. There would be risk of explosion in case the buildings near by were burning so as to really expand the gas by heating the buildings. It is not the practice, however, to erect buildings round gas-holders, to secure them from these accidents. Where gas-holders are exposed, the risk is not that of explosion of the gas, properly speaking, but from the communication of heat to the gas-holder, causing it to lose a portion of its contents, and that portion, mixing with the air, may explode. There are very few cases on record, however, where any risk of that kind has been incurred.

Q. Do you know of any objection to placing the main pipes of distribution under the sidewalks of cities?

A. Where the sidewalks are sufficiently wide, I know of no practical objection to that plan.

Q. Will gas escaping from the main supply pipe injure the health of the city?

A. It will, sir.

Q. In what way?

A. A part of the gas acts as a poison upon vegetable life, and even upon animal life. The gas is absorbed generally through the moisture present, and drawn into the lungs, and destroys life.

Q. Will you state the kinds of gas made in different works?

A. Generally there are two kinds of gas manufactured. The first and highest quality of gas is what is called cannel gas, made either wholly or in part from cannel coal. It can be manufactured by the mixture of two kinds of coal, one of which shall be cannel or its equivalent. That is the best description of gas, for all the purposes for which it is employed. The other gas, made from common coal, known as Newcastle gas, is a gas of lower illuminating power, and is a poorer quality of gas; it is not so well adapted for general use as the cannel gas. Under the last head, I think

would fall those gases made from many of the American coals. Some of those gases have not the character of permanency; that is, they will not bear a reduction of temperature without a very great loss of illuminating power, which diminishes their value in an economical point of view very much.

Q. To which kind does the gas supplied to Boston belong?

A. It would approach the Newcastle gas, as far as I know it at present. I have been very little acquainted with it the last six or eight years, but have had occasion to compare it with other illuminating materials, and have found it to bear the character, generally, of Newcastle gas. It belongs to the second quality of gas, as at present furnished, or as furnished within the past three or four years. I would say, I have not examined it within one or two years at all.

Q. Please go on and state the difference between these kinds of gas in the amount and quality of light.

A. The cannel gas, produced from cannel coal, when burned from an argand burner, affords a light rarely if ever below 20 candles, when five feet of gas are consumed per hour. Five feet is the standard quantity, and cannel gas is generally burned from the argand burner, as it is termed; and when so burned the gas, at the time I examined it in Liverpool, afforded a light equal to 25 candles. That was about the character of the gas manufactured at the Great Western Works in London. Both of those were cannel gases of the highest grade. The gas manufactured in Boston, some ten years since, was cannel gas; in its character, it rarely fell below 20 candles, and rose above, generally.

Q. Have you any statement or memorandum to which you can refer?

A. I have nothing but a rough note here of the testings at different periods. I may say that the experiments made on the gas were made every day; that the burnings occupied an hour of time, generally, and experiments were made for some ten or fifteen minutes, and the results compared with those obtained eight or ten minutes later so as to get an average which would express very accurately the value of the gas. I was responsible for these experiments, and they are here recorded in the rough for some of the months. In the month of May, 1856, commencing the 1st of May, the corrected value of the gas was $19\frac{6}{10}$ candles; May 5th, 21 candles; 7th, 22 candles; 10th, a fraction above 22 candles; 12th, $20\frac{4}{10}$ candles; 13th, $20\frac{8}{10}$ candles; 14th, 22 candles; 15th,

$23\frac{2}{10}$ candles; 16th, $22\frac{6}{10}$ candles; and on the 17th, $22\frac{1}{10}$ candles.

Q. That is by actual experiment?

A. By actual experiment. Those were continued throughout the month. The corresponding days in June show the following results; 10th, 20 candles; 11th, 20 candles; 12th, $20\frac{2}{10}$ candles; 13th, $20\frac{6}{10}$ candles; 14th, $20\frac{6}{10}$ candles. These were in the warm months. To turn to the colder months: December 1st, $17\frac{8}{10}$ candles; 2d, $17\frac{7}{10}$ candles; 4th, $18\frac{5}{10}$ candles; 6th, $18\frac{5}{10}$ candles; 9th, $18\frac{8}{10}$ candles; 12th, 20 candles; 13th, $20\frac{7}{10}$ candles; 15th, 20 candles; 16th, $19\frac{4}{10}$ candles. I ought to state, in regard to the standard here being a little less, that the temperature was exceedingly cold, and observations were made both of the temperature and the power of the gas.

Q. What was the coal actually used at that time?

A. There was a mixture of coal used at that time. It was a mixture of Pictou coal and Albert coal.

Q. Do you remember the price at that time?

A. I do not.

Q. Will you describe the different kinds of flame produced by the different kinds of gases you have mentioned, — the quality of the flame and its peculiarities?

A. Keeping in view the general division of gases, cannel gas and Newcastle gas, we find in the gas from cannel coal proximate elements differing from those present in gas from Newcastle coal, or the second quality of gas. There is more luminous material strictly speaking, and although the cannel gas may be considered as largely a non-luminous gas, carrying a portion which is luminous in its composition, the proportion of that luminous material is not only larger in the cannel gas, but it is differently constituted; it will bear a greater reduction of temperature without a corresponding loss of illuminating power; and the gas itself is a more permanent gas than that derived from the lower class of coal. When we examine the combustion of the gas produced from the lower qualities of coal, or the Newcastle gas, we find the light is not the same color as that produced by cannel gas, and the larger proportion of the non-luminous gas which bears the luminous material causes a little different combustion — one which the eye feels, although it is almost impossible to perceive it; delicate instruments do, however, distinguish the modes of combustion; and, as a general expression, the eye is more fatigued by the gas

from the lower qualities of coal, or the Newcastle gas, than it is while the cannel gas is being burned. In very many situations, Newcastle gas will not serve for illuminating purpose. It is not deemed proper to introduce Newcastle gas into many of the public buildings in England and Europe; and the same remark applies to the mansions of the nobility, where they burn other combustibles instead of gas, introducing it, perhaps, for lighting halls and some other purposes, but for illuminating the rooms, they introduce a richer gas, or continue the use of wax candles. This distinction between the two gases is a well recognized one, and it is very apparent when the two gases are burned in different lights, and brought near to each other.

Q. Which is most economical, with reference to its distribution?

A. The cannel gas, being richer, can be transmitted either through smaller pipes, or a larger quantity through the same pipes, than in the case of Newcastle coal.

Q. As I understand it, the same number of feet of cannel gas would give a larger amount of light than the same number of feet of Newcastle gas.

A. Yes, sir. If a given volume of the two kinds of gas were transmitted through a pipe, when the gas came to be burned, nearly fifty per cent more light would be afforded by the cannel gas than by the Newcastle gas.

Q. And how with reference to domestic purposes? Suppose it is desired to turn down the gas and diminish the amount for the purpose of reading or for ordinary domestic purposes.

A. The cannel gas is the most economical. It can be turned down and still afford light much lower than the Newcastle gas, or the second quality of gas. The amount of light depends in a measure upon the proportion of atmospheric air mixing at the moment of combustion in the flame; and in the case of the cannel gas, when turned down, you have the same rich gas, and a larger proportion of air is brought in and mixed with the flame. In the case of the poorer gas, the proportion of air is reduced, and that diminishes so much the value of the gas as to render it no longer a practical light; you cannot turn it down so low and still obtain light.

Q. And when it is desired to light large places, and bring the light up to its full power, the cannel gas represents nearly fifty per cent more light than Newcastle gas?

A. I should confine that estimate of the proportion of light to

the accurate passing of it through the burner, so as to produce the best effect of combustion. Within practical limits, the combustion of the cannel gas produces about fifty per cent more light than the same value of Newcastle gas.

Q. (by the Chairman). When you speak of Newcastle gas, you consider that the gas made from Pictou coal is of about the same quality as that made from Newcastle coal?

A. The quality made from Pictou coal is very nearly that made from Newcastle coal; I think it exceeds, by one or two candles, the value of Newcastle gas. The Newcastle gas supplied to the city of London for many years, remained constantly, almost, at thirteen candles. Some of the measurements of the gas made from Pictou coal have been a little higher than that, and some have been quite as low. It is practical to make from Pictou coal a gas which, when burned as gas is burned at trials in London, will produce the light of 16 and 17 candles. I say it is practical to do that. I don't know how far it is done, but it can be done and has been done.

Q. (by Mr. Stackpole). How do these lights differ in regard to their action upon colored or printed paper?

A. They differ somewhat. It is a good deal due to the color of the light produced in combustion. The color of the light from cannel gas more nearly approaches that of the light from the sun than the light from Newcastle gas does.

Q. When cannel coal is intermixed with other coal, does a larger proportion of cannel coal increase the illuminating power of the gas?

A. I think there is always a definite ratio in which the mixture produces the best gas. That was the result of an extended series of experiments that I made myself: that certain proportions of the Pictou coal and certain proportions of the different cannel coals would produce the highest quality of gas. If the proportion of cannel coal was increased, of course it increased the cost of the gas, and there was no corresponding increase of illuminating power. If it gained a moment, it was lost subsequently, in its not being an enduring gas.

Q. What is that proportion — do you recollect?

A. I think with dry Pictou coal, of good quality, the proportion added of the highest quality of cannel coal known, the

Albert, was only one-tenth. It was found sufficient to add one-tenth of the Albert for the production of gas, which, as ordinarily burned, would be 25 candles, but which, as corrected, and brought to the lowest possible illuminating power, was about 22 candles.

Q. Do I understand you, that the addition of more cannel coal does not increase the illuminating power?

A. More would increase the illuminating power, and even carry it beyond that which would be economical as light, and produce a smoky flame; but there is no corresponding increase of illuminating power. Doubling the amount of cannel coal would not produce a corresponding increase of light.

If with ten per cent we increase the amount of light from 17 to 22 candles, we should not get a corresponding increase by the addition of another ten per cent as a permanent increase.

Q. (by Mr. Hyde). Taking the cannel coal gas and the Newcastle coal gas, calling them at the same price, and using them as gas is ordinarily used for domestic purposes, what would be the relative gain?

A. The gain would be about fifty per cent.

Q. For ordinary domestic purposes?

A. Yes, sir. One thousand feet of cannel gas would be equal in illuminating power, for ordinary domestic purposes, to 1,500 feet of Newcastle; in other words, the increase in the consumption of the poorer gas would be just about fifty per cent.

Q. (by Mr. Hill). What would be the difference in cost?

A. There would be a little difference in the cost. I am not at this moment acquainted with the cost of coals; but cannel coal used for this purpose has cost about double what Pictou coal costs. But cannel coal furnishes a larger amount of gas than the same amount of Pictou coal, so that a reduction from the increased price of the coal must be made, for the larger amount of gas obtained. I am not at present prepared to state the relative cost, for I do not know the cost of either of these coals. At the time these experiments were made, I think the price of Pictou coal was about $5\frac{1}{2}$ a ton.

Q. (by Mr. Stackpole). Can you get good illuminating gas without using some proportion of cannel coal?

A. You cannot get the highest quality of illuminating gas.

You can get a gas which answers for ordinary purposes, but the highest quality of gas can be made from cannel coal or its equivalent only.

Q. Can cannel gas be manufactured and furnished as easily as Pictou coal gas?

A. It can be manufactured and furnished as easily.

Q. Is there any valid reason why cannel gas, rich gas, should not constitute the whole supply for domestic consumption?

A. I know of no reason why it should not.

Q. In your judgment, is a supply of Pictou coal gas alone advisable for a city like Boston?

A. I can only state my own preference. That would be for the richer gas, or cannel gas; and in the general application of gas it would be better.

Q. Whether or not a supply of rich gas to a city like Boston would be a matter of economy to consumers?

A. That would follow, as a matter of course.

Q. Is it true, that the cost of a rich gas like cannel gas, is not proportionately so much as the value of the increased light afforded?

A. That is true.

Q. Are the expenses attending the distribution of the two kinds of gas the same or different, where an equal amount of light is required?

A. The general expenses would be the same. The amount of illuminating material transmitted would be larger in the case of cannel gas, as a smaller volume of gas would be required to produce the same illuminating power.

We are compelled to keep in view the illuminating power.

Q. That is to say, a smaller volume of gas produces the same amount of light?

A. Yes, sir. And the smaller amount of gas can be transmitted more economically than the larger.

Q. Can you state any objection that exists to the use of cannel or rich gas?

A. I know of none. When the richness of gas is maintained between 20 and 25 candles, experience has proved that in most applications it is not only more illuminating, but more economical.

Q. How would the kind of burner used affect the result?

A. Generally speaking, the richer gases, such as cannel gas, require larger openings in the burner for combustion; but in

most of the arrangements for the combustion of all gases, the apparatus in use will answer for the consumption, economically, of cannel gas.

Q. When stating the illuminating power of the gas consumed from a standard burner, can the community rely upon such statements as applying to the burners in use?

A. In stating the illuminating power of the gas, as restricted by law, we adopt what is termed the standard burner. That burner is adopted to produce the largest amount of light from the gas consumed from it. The pressure then (which is a very important element in the production of light, or in the economy of light) is also adapted so as to be most favorable to the combustion of the gas; and we then determine accurately, under the best conditions, the illuminating power; and that determination is always higher than the illuminating power as measured from the common apparatus in use; it is always considerably higher. On the other hand, there are certain adaptations of burners which will carry the illuminating power still higher than the argand burner, which is the standard burner. I mean, that with certain particular adaptations, we can burn gas with a higher illuminating power than the standard burner chosen shows. But there is some ratio of difference between the higher result obtained in burning from the standard burner and the average consumption.

I don't know what that difference is. But in the statement of the illuminating power according to the law, the number of candles, which is the measure, is somewhat larger than that which would be the result of estimating the power of the gas from the average of the burners used in our dwellings.

Q. Then, if the gas is tested in a burner, and under the pressure best adapted to it, the number of candles that it is found to equal will be higher than the average?

A. That follows, of course, sir. The conditions are assumed to be the most favorable to the combustion of the gas, and therefore a higher illuminating power is obtained than the gas would produce under the ordinary arrangements in dwellings.

Q. Are not these so well adapted to bring out the illuminating power of the gas?

A. The gas is ordinarily burned, under all arrangements of that kind, under a higher pressure, which diminishes the illuminating power.

Q. Is any such inspection of gas a fair test, in your judgment, of the average burning of the gas throughout the community?

A. It does not correspond to that average combustion and illuminating power as burned over the city. The average of the illuminating power will be lower than that which we obtain when we test the gas under the best possible conditions.

Q. Can you state how much lower?

A. Considerably lower; I cannot state now how much.

Q. How in the matter of pressure, also?

A. The pressure affects the economy of burning very much indeed. The pressure under ordinary combustion in the city not only varies, but is very much greater than we use when we make experiments with accuracy. I think you will find the statement in the English law exactly.

Q. Could a mode of testing gas be devised, or is such mode known, by which the value of gas, as consumed by the community generally, can be ascertained?

A. I think an approximation might be made. I don't think any accurate determination could be had.

Q. A better approximation might be made than the one under this statute — or how is it?

A. I think if the kind of burner generally used, — that is, the larger average of burners, — could be known, a few experiments with those would determine the relation between the best arrangement and the one in common use, which would be a solution of the question.

Q. (by Mr. Hyde). How often do burners in ordinary use need to be renewed?

A. I hardly know. If they are carefully attended to, they will last for a very long time without renewal. It is just a matter of care. In some situations, burners become injured rapidly, and in others they remain for many years in good condition.

Adjourned to Wednesday evening at 7 o'clock.

WEDNESDAY, Nov. 21.

The Committee met, according to adjournment. Mr. Jewell stated that one of his witnesses, Mr. John H. Blake, was about to start for Europe, and asked that the examination of Dr. Hayes might be suspended, to enable him to introduce the testimony of

Mr. Blake. The Committee assenting, Mr. Blake was called and examined.

TESTIMONY OF JOHN H. BLAKE.

Q. (by Mr. Jewell). Won't you state how long since you first became acquainted with Gas Companies and what your experience in the manufacture of gas has been?

A. It is some thirty years since I was first interested in the manufacture of gas in this country. I had for several years the charge of the Boston Gas Works, and subsequently constructed gas works in various cities, and have been also employed as consulting engineer.

Q. State what your experience has been, and means of knowledge as to gas works in foreign countries and in this country.

A. I have visited many in this country and many abroad, in England, Scotland, and on the Continent.

Q. How long is it since your connection with the Boston Gas Light Company ceased?

A. My impression is about 1847, but my memory of dates is not precise.

Q. You are not a stockholder in the Boston Gas Light Company?

A. I am not, sir.

Q. And have not been for many years?

A. I have not been since my connection with the Company terminated.

Q. Will you describe the condition of the Boston Gas Light Company's works at the time you left, in 1847 or 1848?

A. They were in very good condition, but small compared with what they are now.

Q. Have you to-day visited the Boston Gas Light Company's works?

A. I have been through the works to-day.

Q. Will you state to the Committee their comparative extent and condition?

A. The works are in excellent condition, and compare favorably with the majority (I was going to say average) of the works that I have known both in this country and abroad.

Q. Did you examine them sufficiently to be able to state to the Committee whether or not these works contain all the modern improvements and perfected machinery common in gas works?

A. I think they do, sir.

Q. In regard to their apparatus for the purification, measurement, and storing of the gas?

A. It seemed to me to be ample and perfect.

Q. Did you examine the gas as to its purification?

A. I did, sir.

Q. How did you find it, sir?

A. I found it to be very pure.

Q. To your knowledge, was there any preparation on their part for your visit. That is, was the Gas Company aware of your visit to-day?

A. Not to my knowledge. It would be very difficult to change the works.

Q. Did you also test the illuminating power?

A. I tried the illuminating power with the photometer.

Q. What photometer did you use?

A. Bunsen's. The one I found at the works.

Q. And what was the illuminating power of the gas?

A. Twenty-one candles. What is called twenty-one candle gas.

Q. Is Bunsen's photometer the best that is used now?

A. I think it is.

Q. It is the common standard photometer used everywhere, is it not?

A. It is in general use everywhere. I believe I may say it has been generally adopted by all Gas Light Companies.

Q. As well in this country as abroad?

A. Yes, sir.

Q. Will you state to the Committee whether you examined the tickets showing the kinds and quantity of coal used from day to day recently?

A. I did: made a hasty examination.

Q. What, if you recollect, did you find the coal used by the Gas Company from day to day to be?

A. Pictou coal, Albert coal, in small quantities, and another kind of coal the name of which has slipped my mind at this moment.

Q. Lingan coal?

A. Lingan coal: in the proportion, I think, of about 60 parts of Pictou, 60 of Lingan, and 7 to 10 of Albert.

Q. How does the Pictou coal compare with the Newcastle coal in the production of gas?

A. No better gas can be made than can be made from Pictou coal, — Pictou coal alone; but the yield is small compared with that of many other kinds of coal.

Q. Will you explain a little more fully your views in regard to the quality of the gas made from Pictou coal, as compared with other coals?

A. Pictou coal alone does not yield what is called a rich gas. It yields a gas, which, tested by the photometer, would be called about a seventeen candle gas, provided that the quantity obtained is not too large — provided that the coal is not continued too long in the retorts, or, what amounts to the same thing, that the charges put into the retorts for a given number of hours are not too small. The light from gas obtained from Pictou coal alone is pleasant, diffusible, and, as I said before, about seventeen candle gas. It is a pleasant and agreeable light. I have made hundreds of thousands of feet from Pictou coal alone, and given entire satisfaction; never had a complaint.

Q. Do you know the difference between the productive power of the Newcastle coal and Pictou coal; that is, whether the Pictou is or is not somewhat better than the Newcastle?

A. The Newcastle yielded more per pound or per ton than the Pictou at the time that I knew the Pictou coal. The mines vary. The character of the coal may vary. I cannot speak of what Pictou coal may be to-day.

Q. Do you know the comparative value of the Lingan and Pictou coals?

A. I do not.

Q. Assuming that the Lingan and Pictou are equally valuable, what is the effect of the introduction of from seven to ten per cent of Albert coal in connection with them?

A. It would increase the specific gravity, and increase the amount of light given by a given quantity of gas.

Q. Increase the illuminating power as tested by the photometer?

A. Increase the illuminating power as tested by the photometer, ordinarily.

Q. Would you call the gas you saw produced to-day, from the materials from which it was produced, Newcastle gas or Cannel gas? that is, would it approach more nearly to one or the other?

A. It would approach more nearly to what is known in England as Cannel coal gas. It is a rich gas. My objection to it would be that it is too rich.

Q. Will you explain that remark to the Committee, sir?

A. I do not know that I can better explain it than by a comparison between the light from coal oil in a lamp, or camphene, as compared with the light from a gas burner. The light from the camphene lamp is an intense light, a very strong light, and side by side with the gas light, will cast a stronger shadow upon the wall than the gas light; but at a distance of thirty or forty feet, if the trial is made, it will be found that the gas light casts the strongest shadow. It is an intense light, near to, but does not light up a large apartment so well as a more diffusible light.

Gas which has the greatest specific gravity approaches more nearly to the coal oil or camphene lamp; gas of a less specific gravity gives a light which is more diffusible — lights up an apartment better.

Q. (by the Chairman). What do you term a camphene light? What is the material that you burn?

A. The article sold as camphene was oil of turpentine with alcohol. The varieties of oil which are in the market, derived from both the destructive distillation of coal and from oil wells, as they are termed, approach very nearly to the camphene oil, so called, which was in the market some ten or fifteen years ago — liquid hydro-carbon.

Q. It is not in use now at all?

A. The coal oil is in use, and gives a light very similar.

Q. I know that, but camphene is not in use, is it?

A. I think not.

Q. (by Mr. Jewell). Are you acquainted with the means of distributing and storing gas employed by the Boston Gas Light Co.?

A. I am, sir.

Q. Will you state, then, their adaptedness and capacity for the supply of such a city as Boston?

A. The gas-holders are located in different parts of the city. They are ample at the present time, and they serve to equalize the pressure.

Q. State whether it would be practicable to equalize the pressure, if the gas was distributed over a distance of four, five, or six miles, without gas-holders at various points.

A. Only by very large mains. Possible, but not practicable.

Q. Are you sufficiently acquainted with the gas produced in

this State by the various corporations, to compare them as to quality with the gas produced by the Boston Gas Light Co.?

A. I have not examined of late years the gases produced by the various cities excepting by observation — by the eye.

Q. Comparing them in that way, what is the character of the Boston gas?

A. The only objection I have to make to the gas produced by the Boston Gas Light Company is, that it is too dense. I think it would give better satisfaction if it was a less dense gas.

Q. About what degree of illuminating power?

A. Instead of 21 or 22 candle gas, to use the ordinary phrase, which is generally understood, if it were 17, possibly 18, — but 17, I think, would give better satisfaction than 21 or more; and for the reason which I have just given; and also because a rich gas, so termed, is liable to smoke; when currents of air are produced by opening and closing the doors of an apartment, a portion of the gas escapes unconsumed, carbon is given off, and the light smokes.

Q. Do you know of any other gas company in the United States that tries to make gas of as high a value as the Boston Gas Light Co.?

A. I do not.

Q. Do you know of any gas company in the United States that uses as rich materials?

A. I know of no company now using the Albert coal, which gives a very rich gas.

Q. Are there any to your knowledge that use Cannel coal?

A. I really ought not to answer that question, because I do not know whether they do or do not. Those with which I am acquainted are not using Cannel coal.

Q. Is it not a fact that substantially the whole gas of New England is produced from Pictou coal, or coal equivalent to that?

A. I can't say to-day that such is the case. It was so when I had knowledge of it.

Q. (by Mr. Curtis). Can you state whether the transmission of gas through a long main, of whatever size, four or five miles from one main gas-holder, has any effect upon its illuminating power?

A. It would depend upon the gas itself — upon the material from which it was produced. Some gases are liable to condensation, taking on the liquid form.

Q. (by Mr. Jewell). Are you aware of any location in the vicinity of Boston as favorable for the establishment of gas works like those necessary to illuminate this city as that occupied by the Boston Gas Light Co.?

A. I know of none, unless it be what is called Roxbury Point. The Boston Gas Works are well situated for drainage, and they have the advantage of deep water, which is a matter of very great importance, that the coal, which is the great article of consumption, may be landed near the works, from vessels of various draught, large and small.

Q. Could vessels of large size go to Roxbury Point and deliver cargoes?

A. No, sir. The present situation of the Boston Company's works have that advantage over works situated at the place which I designate.

Q. Are not the flats in the vicinity of Roxbury Point left entirely exposed at low water?

A. The flats are. The channel, I believe, is always navigable.

Q. Would not, in your judgment, the drainage from works like the Boston Gas Light Co.'s Works become a nuisance to the people at the South End, if it was allowed to flow in at high water, and diffuse itself over the flats, and so be exposed at low tide?

A. Unquestionably they would, if they were allowed to escape, not utilized.

Q. With regard to the construction of gas works, state whether in your opinion it would be practicable to construct works for the supply of the city of Boston at any thing like the present cost of the Boston Gas Works.

A. I should say that it would cost at the present time full fifty per cent more than those works have cost.

Q. With regard to the economical management of works like these, how would the management by the city compare with the management by a private corporation, in your opinion?

A. I have no doubt that they would be more economically managed by a private corporation than by the city government.

Q. Taking into consideration the cost of the works, the outlay for their construction, and all the other items of cost, state whether, in your judgment, gas could be manufactured by the city of Boston itself and delivered to the citizens, cheaper than gas is now delivered by the Boston Gas Light Co.

A. No, sir.

Q. How does the present cost of gas to the city of Boston compare with the cost of gas in other towns in New England and in this country?

A. It is less than in the majority of cities and towns, not only in New England, but throughout the United States, even including those where they have coal at their doors — at hand.

Q. Do you know the present price of gas at Pittsburg, in Pennsylvania?

A. I have heard the price.

Q. Do you know the cost of coal at Pittsburg?

A. I do not now. I have known the time when it was only a few cents a bushel. To-day, I cannot say I know the price.

Cross-examined by Mr. Stackpole.

Q. Did you go down to the gas works and make an examination this morning at the request of the Company, expressly for the purposes of this hearing?

A. I went at the request of the Company's solicitor, much against my own will.

Q. And he told you it was for the purpose of this hearing, so that you could come here and testify?

A. He requested me to come here and testify, and to go and see the works. I went there that I might answer understandingly.

Q. I understand you to say that the Company have all the latest improvements, so as to make gas in the most economical way?

A. I did not say so.

Q. Is that so or not?

A. I think they have, essentially.

Q. And from the fact that coal is brought directly to their wharves, they get it with as little expense for freight as they could at any place in the city, I suppose?

A. I think so.

Q. What gas companies are you connected with?

A. I am President of the Lawrence Gas Light Co.

Q. Are you connected with any other company?

A. The Cambridge.

Q. President of the Cambridge?

A. Also.

Q. Any other company?

A. No other, at the present time?

Q. Are you a stockholder in either of those companies?

A. I am.

Q. When you tried this gas at the gas works, it was directly from the works?

A. The gas came immediately from the works.

Q. And it was warm?

A. Not cold.

Q. It was not at the same temperature that it is when delivered throughout the city?

A. I should think it might be a few degrees warmer.

Q. What burner did you use in ascertaining the illuminating power?

A. The common argand burner.

Q. And what pressure?

A. I did not observe the pressure.

Q. Do you remember the height of the chimney?

A. I did not measure it, but it was the ordinary glass chimney, 6½ or 7 inches perhaps.

Q. Does Pictou coal make as good gas as Cannel gas?

A. That depends upon circumstances. It yields a much less quantity. When a charge of coal is placed in the retort, the first product which comes off is inferior; say the first half hour, it is inferior to that which follows; and towards the latter part of the four hours, which is the usual time that the coal remains in the retort, having obtained its maximum of richness, it then yields gas of an inferior quality. Of course, the whole is mixed together in the gas-holder.

Q. Taking the average quality of Pictou coal by itself, what degree of illuminating power will it yield?

A. It depends upon the length of time, or what amounts to the same thing, the quantity of coal that is put into the retort as a charge, and the temperature of the retort. Under the best circumstances, it will yield gas of about what is termed seventeen candle power. It can be made to do that.

Q. What is the average?

A. That is a question which I cannot answer.

Q. What is the lowest, to your knowledge?

A. Oh, I have known it to be less than one.

Q. You cannot give the average?

A. Let me explain. Occasionally it is the case, on a Sunday, when the consumption is small, that the retorts do not require to have their contents withdrawn, and a new charge of coal put in; the gas-holders are full. Now, I have known it to be the case that the workmen would not withdraw their charges, leaving it for the morning watch, who came on at six o'clock, to draw those charges: and during those latter hours, the gas which has been generated by the coal and which has gone into the gas-holder and mixed with the other gas, has scarcely had any illuminating power at all. I have, in my own experience, occasionally found, on Monday, that the gas was of an inferior quality, and in seeking to know why it was so, I have discovered that neglect on the part of the workmen; and I have tested such gas in experiments which I have made, keeping in a charge for twelve hours, and ascertaining the quantity of gas generated during each one of those twelve hours, when four hours would be sufficient, drawn off each hour a portion of that gas, and found that that generated during the latter part of the time had scarcely any illuminating power.

Q. Seventeen candles is the highest yield that you have ever known of Pictou coal by itself is it?

A. I have never known it higher than that.

Q. And that is rather unusually high, is it not?

A. Not with care.

Q. I mean to say that it is higher than the usual run of Pictou gas ordinarily made?

A. I think it is.

Q. You said, if I understood you right, that you had not known so much of Pictou coal of late years?

A. That is so.

Q. How long since you have had experience of Pictou coal?

A. Perhaps ten years.

Q. Then you testify with regard to Pictou coal as it was ten years ago?

A. As it was ten years ago. Then the mines yielded a coal remarkable for its uniformity; what it is to-day I cannot say. But of all the coals that I have ever examined, the Pictou mines have yielded the most uniform quality.

Q. When you spoke of the gas of the city of Boston as too rich, I suppose you referred to the gas as you saw it to-day — twenty-one candle gas?

A. I refer to it from my own observation in years past. I should prefer it, for my own use, of less specific gravity.

Q. Well, how many years past?

A. Ten or twelve.

Q. To come directly to the gas made to-day, I want to ask particularly whether you say it is too rich when it comes up to twenty-one candles?

A. I prefer gas of about seventeen, as I remarked before. I would willingly pay more for gas of what is termed seventeen candle power, than twenty-one or twenty-two.

Q. But at the same time, the twenty-two candle gas would give the greatest expanse of light?

A. Near to, but not at a distance.

Q. Well, how about thirty candle gas, compared with seventeen?

A. I should not want it at all, at any price.

Q. There are two classes of gas in England distinctly recognized?

A. Distinctly.

Q. And the richer people use the Cannel gas, don't they?

A. I think they do.

Q. And Newcastle gas is confined to lighting the houses of the poorer classes, and to lighting large halls?

A. So far as my knowledge and experience goes, in dwelling-houses in England, wax candles are used.

Q. I suppose that is among people who are wealthy?

A. The very richest class.

Q. I mean to say, that among the middling class, who can afford to use gas, the Newcastle gas is used?

A. Among the middling class, they use the Newcastle gas.

Q. And there the Cannel gas costs more than the Newcastle gas does?

A. It commands a higher price.

Q. In regard to the length of mains do you recollect the length of mains in the city of Philadelphia?

A. I do not.

Q. Do you recollect the length of the mains in Manchester or Liverpool, England?

A. No, sir, I have no recollection.

Q. Is not the gas carried through those mains over a distance of four miles?

A. I can't say: it is not improbable.

Q. And in Paris?

A. In Paris, it is carried a long distance.

Q. And there are no gas-holders in the city are there?

A. Yes, sir.

Q. The gas is carried through the mains a distance of four or five miles?

A. Oh, yes, there is no difficulty about carrying it.

Q. In our gas-holders in Boston, is the gas coming in at the same time it is going out?

A. Well, generally, it is passing in during the twenty-four hours in some cases, and the gas is passing out five or six hours.

Q. And it is coming in during those five or six hours?

A. It sometimes is flowing in.

Q. Is it not generally?

A. No, sir.

Q. Well, how about a majority of the time?

A. I think during the hours when the gas is lighted, that it will be found that all the gas-holders in the city are falling; the gas is passing out; more passing out than passing in.

Q. What I want to find out is, if it is not going in and out at the same time; not whether the amount there is decreasing or not, but whether there is not a supply of gas coming in from one pipe and gas going out at another.

A. I should think not, during the hours of burning, excepting in the early part of the evening, when few burners are lighted, and the latter part of the evening, when also few are lighted.

Q. How is that arranged? Is there any special arrangement made so that the gas cannot go in?

A. No.

Q. Why should not the gas coming through the regular mains flow into the holders during those five or six hours? What is to prevent it?

A. If it is consumed before it gets there, it cannot enter. If a stream of water passing through a pipe leading to a reservoir is tapped all along on the way, and the full capacity of that pipe drawn off, none will enter the reservoir.

Q. I am aware of that, but I am asking as a matter of fact, not as a matter of principle. As a matter of fact, whether you know or not.

A. As a matter of fact, I cannot say. There are no means of knowing that.

Q. When you say that no Company makes better gas than the Boston Company —

Witness. I think I did not say that. Richer, and by richer, I mean what is ordinarily understood by that term; a gas of high specific gravity.

Q. Does no company in the United States make as rich a gas as the Boston Company?

A. I cannot say.

Q. Are you acquainted with the material that is used in the gas companies in the United States, so that you can say whether other companies do not use as rich material?

A. Not to-day.

Q. When you say that the company can supply gas cheaper than the city, do you take into that calculation the profits of the company also?

A. I do.

Q. Then you think the company could make its profits and supply gas cheaper than the city, do you, the city supplying at cost?

A. Not if the city had the same advantages.

Q. Suppose the city had the same advantages?

A. Of course they could.

Q. For instance: suppose the city were to buy out the Gas Company, and take its works, could not the city supply the citizens with gas at a less rate than the company?

A. They might be content with two per cent on the investment, but no corporation would be content with so small a per centage on their investment, and in that way, the city might supply the citizens more cheaply.

Q. Then you supposed, in that answer, that the city were to go to work and erect their works at the present time, and bring them into competition with the existing company?

A. If they had to build their works at the present time, I think they would cost them fifty per cent. more than the present works have cost the Boston Gas Light Co. I think there is that difference in the cost of the materials.

Q. But if the city went on for a number of years making its gas and supplying it to citizens, after a while they could supply it more cheaply, couldn't they, supplying it at the minimum cost?

A. If they paid six per cent. for their money, and the present

Gas Light Co. divided ten per cent., and would not be satisfied with less than ten per cent., that would be a difference in favor of the citizens of four per cent.

Q. Do you know what gas costs to-day in Cincinnati and St. Louis?

A. I don't know what gas costs to-day in any city in the Union scarcely.

Q. Do you know what the price of coal in those Western cities is?

A. I do not.

Q. Is not the compactness of a city an element in cheapening the supply?

A. A very important one. The more dense the population, the more cheaply it can be supplied.

Q. Do you know of any city in the United States which is supplied by a single company which is more compactly built than Boston?

A. Not one.

Q. Do you know what kinds of gas are supplied in Manchester, England, or Liverpool?

A. Not to-day. It is some years since I was in those cities. Not since 1858.

Q. Do you know what the prices are?

A. I do not.

Q. Have you made any special examination into the expenses of the Boston Gas Light Co., so that you can speak specially in regard to that?

A. I have not, sir.

Q. You don't know what profit they have made?

A. I have had no connection with the company for very many years, and know to-day nothing, I may say, about their affairs. I have no interest in the company.

Q. (by the Chairman). I understood you to say it was thirty years since you had any thing to do with the management of the Boston gas works?

A. No, sir. I said it was thirty years since I had first been interested in the subject of gas works.

Q. You say the works of the Boston Gas Light Company compare favorably with any works you have ever seen?

A. No, sir, with the majority.

Q. How many years is it since you have made the examination of any in Europe?

A. In 1858.

Q. Did you make a thorough examination of them?

A. I did of some, particularly the works in London. I visited them all.

Q. Did you take any pains to find out the modern improvements when you were there?

A. I made it my special business for a time.

Q. You were then interested in gas works?

A. I was.

Q. If Pictou coal makes too rich a gas, why do you mix Cannel coal and Albert coal with it?

A. Pictou coal does not make too rich a gas.

Q. I thought you made the remark that gas was too rich made from Pictou coal?

A. No, sir. I said I thought the gas made by the Boston Gas Light Co., as I had observed it for some years past, would give better satisfaction if not so rich.

Q. And you say the gas is too rich?

A. I deem it so.

Q. Then why mix Albert coal with the Pictou?

A. I cannot answer that question. I do not mix Albert coal with it.

Q. From what do you manufacture your gas in your works?

A. We use no Albert coal in the works in which I am interested.

Q. What kind of coal?

A. Pictou and Cannel — mainly Pictou.

Q. Why do you mix any Cannel with it?

A. The Superintendent of the works thinks it gives better satisfaction. That is a matter of opinion. But a larger quantity of gas can be produced in a given time, and there are times when the demand is great, and it is desirable to have on hand a quality of coal which will produce it more rapidly. We therefore have always been in the habit of keeping on hand Cannel coal, so that when there was liability of a deficient supply, we could increase the production in a given time.

Q. Do you not find it necessary to mix a larger percentage of Cannel coal with Pictou coal in the Winter than in the Summer?

A. The demand is greater in Winter than in Summer.

Q. But is that the reason?

A. I think it is.

Q. Do you not find it necessary, in excessively cold weather, to mix Cannel coal with Pictou coal in order to get a quality of gas that will suit your customers?

A. I have lighted this city with Pictou coal gas, as I before remarked, and given entire satisfaction — had no complaint.

Q. What season of the year?

A. During the entire Winter.

Q. (by Mr. Stackpole). Will you state the date?

A. I cannot state the date.

Q. Well, as near as possible?

A. I think it was the Winter of 1845, or '46, but without my note-book I cannot say.

Q. (by the Chairman). Is it not more desirable to burn a rich gas in your house — that is, rich gas made from Cannel coal — than gas made from Pictou coal, as regards the health of your family, and as regards the effect upon your furniture, silver ware, &c.?

A. Of the two, if I must have my house supplied with one or the other, I should prefer a gas made entirely from Pictou to one made entirely from Cannel coal.

Q. In your factory, would you not manufacture your gas altogether from Cannel coal, if it cost no more than Pictou?

A. I should not.

Q. If Cannel coal yields gas of from 25 to 30 candles, and Pictou gas of only 12 or 15, would it not be for your advantage as a corporation to use Cannel coal instead of Pictou?

A. No, sir; the advantage to the corporation would be in producing the lightest gas that would give satisfaction to their customers.

Q. If you burn a very rich gas made from Cannel coal, can you not burn it under a very much less pressure than you are obliged to burn Pictou gas?

A. That is so.

Q. And you burn less?

A. The richer the gas, the less is consumed.

Q. And you get a better light also?

A. Under the same pressure, with the same orifice, the rich gas consumes less.

Q. What is the difference in cost to the consumer between gas under a half inch pressure and under two and a half inches?

A. I cannot answer that question, but every consumer has it in his power to burn under any pressure that he pleases. The difference I cannot state.

Q. You have no knowledge?

A. No knowledge. But it is more economical to burn under the diminished pressure than under the increased pressure.

Q. Does it cost more to burn gas in the upper rooms of a house than it does in the basement?

A. I really do not know how to answer that question.

Q. Have you any knowledge what the increase of consumption is with the increase of pressure?

A. It is very large.

Q. Well, what is the increase for every ten feet of ascent — going up from the basement of a building to the upper rooms?

A. I have never experimented on the subject, and have no means of answering the question.

Q. You are President of two Gas Companies, are you?

A. Yes, sir.

Q. (by Mr. Stackpole). Do you know why the Bank of England uses Cannel gas only?

A. I did not know that they did.

Q. Do you know whether the city of London adds volatile oil to the Newcastle gas in their street lamps?

A. I know that it is so in some places, but exactly where I cannot state.

Q. Do you know what the reason is?

A. The object is, to have the gas, as it passes over this liquid hydro-carbon, take up a portion of it, and give increased light.

Q. It makes it richer, does it not?

A. Of course it makes it richer. It has the vapor of the hydro-carbon.

Q. So that the street lamps diffuse more light?

A. No, sir; they approach more nearly to the coal oil lamp. They give more light near by, but they do not diffuse more light at a distance.

Q. (by the Chairman). Can you tell me why the wealthy classes in England prefer to use gas made from Cannel coal rather than from Newcastle?

A. I do not know the fact.

Q. There are two kinds manufactured there. The cheaper kind is used in the manufacture of small wares, &c., the lighting of large halls, and among the middling-interest class. Why is it that the wealthy class use this higher cost gas?

A. In England, until within late years, there has not been near so much attention paid to the purification of the gas as in this country; and the reason why it has not been more generally introduced into dwelling-houses has been because it was not thoroughly purified. The poor coals which have been used in England for making gas, contain sulphuret of iron in large quantities, and the gas resulting is highly charged with sulphurous acid, or sulphuret of ammonia — a bad smelling gas. The Cannel coal is nearly free from iron pyrites, and the product of its destructive distillation contains but little of the sulphurous acid.

Q. Are not the two kinds of gases regulated in their quality by Parliamentary law?

A. Yes, sir.

Q. And they must be of that standard quality or else the companies are subject to fine?

A. Yes, sir. The gas from Cannel coal is of a higher illuminating power than that from Newcastle coal.

Q. Have you any knowledge of the gas works in the city of New York?

A. I have been familiar with all the gas works in the city of New York, but not very recently.

Q. How many years ago?

A. It is five or six years since I visited the New York works, the Manhattan works, and the Brooklyn works.

Q. You have no knowledge of any improvements they have introduced there over the works here in Boston?

A. The introduction of clay retorts as a substitute for iron is deemed by some to be an improvement, and by others not. There are differences of opinion on the subject.

Q. Which would you introduce to-day if you were going to build new works?

A. It would depend upon where I was going to build the works.

Q. Say in Boston or New York.

A. In Boston to-day, with the high cost of fuel, I think I should introduce iron retorts, but if I was where fuel was cheap, I should by all means use clay retorts.

Q. In which of the two cities is coal the cheapest, in Boston or New York?

A. About the same.

Q. Is it not cheaper in Boston than New York?

A. I should think not.

Q. Have you any knowledge on the subject?

A. I have not; but I see no reason why it should be cheaper in Boston than New York.

Q. (by Mr. Jewell). Are there any companies in London that make Cannel coal gas except the Western and Chartered Companies — two out of the thirteen companies in that city?

A. I cannot answer for to-day. At the time I was there, I think there were only two companies using Cannel coal in the production of gas.

Q. Can anybody use Cannel gas unless it is made in his district, whether noble or simple?

A. Of course not, if it is not supplied within his district.

Q. (by the Chairman). What quantity of coke do you obtain from a ton of coal?

A. Well, sir, formerly, when I had charge of the Boston Gas Works, from a chaldron of thirty-six bushels, the average was about forty-five bushels of coke.

Q. What quantity of coal tar do you obtain now from a chaldron of coal?

A. I cannot answer the question.

Q. Coal tar is now an article that is sold in the market; there is a regular price for it, is there not?

A. It is now, I think, an article in demand. Formerly it was difficult to get rid of it at any price.

Q. Thrown away entirely, was it not?

A. A good deal.

Q. Do you know what its value is now by the barrel?

A. I do not.

Q. Does not your company sell it?

A. We do.

Q. As President of the Company, have you not seen any returns of what they get for it?

A. I have not. I have seen the annual and semi-annual reports, giving the general results, but not the details.

Q. Is there not about as much obtained from the sale of the coke and coal tar as the coal costs per ton or chaldron?

A. It used to be so; and in some places, the coke has a greater value than the coal, — the Western cities, for example, where coke is an article in demand, and where coal is very cheap.

Q. (by Mr. Jewell). Will you give to the Committee the proportion which the cost of the coal bears to the total cost of the production of a thousand feet of gas?

A. Not counting interest on the capital invested, but simply the cost of the gas, including labor, etc., about one half.

Q. Did you ever know a gas company where the sales of coke and tar half equalled, or any thing like it, the cost of the coal?

A. No, sir; because they consume their coke in the production of the gas.

Q. (by the Chairman). What percentage of it?

A. That depends upon the works. The best result I have ever known has been the consumption of $\frac{2}{15}$ of the product.

Q. How is it that they sell so much in the market?

A. They consume $\frac{2}{15}$; they have the balance for sale. But I think there are not many gas works where the consumption is so small as $\frac{2}{15}$ of the product of coke. This coke is burned under the retorts for the purpose of decomposing the coal of course.

Q. You are speaking of the production of gas in iron retorts?

A. I was not. I had in view a combination of clay and iron, where the greatest economy of fuel that I have ever known was obtained. The clay retorts were first heated, and then the gases were passed over the iron retorts situated above them.

Q. Ordinarily, the consumption of coke is much greater than $\frac{2}{15}$ for the production of gas?

A. Very much greater.

Q. With clay retorts alone, how would it be?

A. With clay retorts alone it would be very much larger than with iron. And the reason why the cost of fuel is an important matter to consider is because, with the clay retorts, a portion of them have all the time to be exposed to a current of air, to burn out the deposit of carbon which is formed upon them. They fill up with hard carbon, and hence are rendered useless until this is removed — burned away. There is, therefore, a heavy expense

for fuel in keeping up the retorts which are not in use — burning out the deposit of carbon on the inside.

Q. (by the Chairman). Where the pipes are too small for the delivery of the gas consumed, it must be given under a higher pressure than it would have to be if the pipes were sufficiently large?

A. Certainly.

Q. Does it not cost the consumer more for his gas where the pressure is so great in consequence of that?

A. Yes, sir.

Q. How much percentage more, supposing you go from half an inch pressure to two and a half inches?

A. I should think it might be ten per cent more. That is guess work however.

Q. Where the mains were put down twenty years ago, in a city like Boston, which has increased largely in population, the mains should be removed and replaced by larger ones, to secure an economical destribution of the gas, should they not?

A. Unless the gas-holders are distributed over the city. That would answer the same purpose as increasing the size of the mains.

Q. Where the supply of gas is given at a great pressure, for instance, two, two and a half or three inches, what is the waste in consequence of that great pressure?

A. That depends upon the individual who is consuming it.

Q. What is the waste of the gas from leakage in the mains?

A. None, if the mains are in good order.

Q. Do you never make any account of wastage or leakage in your companies?

A. I never have counted it at any thing, excepting when a main broke. The detection of a small escape of gas is so easy that there is no excuse for wasting it by leakage.

Q. It was testified at the State House a year or two ago, by three gas men, that the wastage was from 20 to 25 per cent in every company.

A. It is an impossibility. I have detected in riding through a street, a leak in a main, have had workmen dig down to it, and upon lighting it, it did not give a blaze larger than a common candle, the escape being not more than at the rate of a foot an hour. I have detected such a leak in passing through a street.

Q. You make no calculation for wastage in the corporations you manage?

A. Not from leakage of gas. There is a condensation. There is a difference between the record of the station meter, so termed, and the record of the consumers' meters. As a general thing, when measured at the works, it is measured at a higher temperature than when it is delivered to the consumer. There is, therefore, a contraction from reduction of temperature, and there is more or less carburetted hydrogen that takes on the liquid form.

Q. (by Mr. Stackpole). Do you know what, of late years, the London Gas Light Companies have allowed for leakage?

A. I do not, sir. I know that is a phrase that is very often used among gas companies, but it always seemed to me to be a very improper phrase to use, as a very small escape is easily detected.

Q. Speaking of the leakage of London gas, the Gas Light Journal, published last June, says the leakage has been reduced to ten per cent. What do you say to that?

A. The word "leakage" is one I should not use at all. I deem it to be an improper phrase.

Q. What does it mean?

A. It means the difference between the record of the station meter and the record of the consumers' meters.

Q. Then in your answers to the Chairman, you have used the word "leakage" in its proper sense, as you regard it and not in the common acceptation of the term?

A. The difference between the amount measured as having been made and the amount measured as having been sold. Unquestionably, there are places where gas is used without the knowledge of the company. I have known many such cases. The article is consumed; somebody has the benefit of it without paying for it. That might be called a leakage, but it is not an escape of gas into the atmosphere; it is not a waste.

Q. (by the Chairman). Where a gas pipe passes in the street, ornamental trees will be killed by the gas, frequently. If there was no leakage, what would kill the trees?

A. The leakage, in those cases. That is wastage, but nothing like ten per cent, or thirty per cent, as you speak of. That is absurd. I have known cases where, from a break, a very large

leak would take place, but it is immediately known and remedied.

Q. (by Mr. Jewell). By the term "leakage," you understand condensation, leakage, stealings, and all other losses of gas between the place of manufacture and the place of consumption?

A. That is it.

Q. All gas unaccounted for?

A. All gas unaccounted for.

Q. (by Mr. Stackpole). Have you ever known it to equal twenty per cent?

A. I have not.

Q. You stated the proportion that the cost of the coal bore to the entire cost of the manufacture of gas as one half. Will you state the items from which you make that calculation?

A. I answered, to the best of my judgment, about one half. The items of cost are labor, superintendence, repairs of the mains, salaries of the officers connected with the corporation, taxes, (an important item,) and, in short, every expense except interest on the capital.

Q. Do you understand that coal is half the price of gas?

A. I should think it was about one half, at present prices.

Testimony of A. A. Hayes, resumed.

Q. (by Mr. Stackpole). What retorts are generally used now in gas works? whether clay or iron, I mean.

A. In the English and French gas works, and in those of Belgium, clay retorts are preferred to iron, and I believe they are generally used throughout Europe in the larger works.

Q. How about this country?

A. In this country, in the larger works, they have been substituted for iron retorts.

Q. Whether or not to the general exclusion of iron retorts?

A. I think a larger number of clay retorts are now in use, so far as my own observation extends, than of iron retorts. In the large works, especially, they are used instead of iron.

Q. Do you know whether Cannel gas is used in the Bank of England?

A. It was at the last advices I had from there. I don't know that I can state precisely, nearer than two or three years.

Q. And how far off are the works of the Western Company there, that makes the Cannel gas for the Bank of England?

A. I do not recollect the distance precisely. It is eight miles, I should think.

Q. So that the gas pipes run eight miles, at least?

A. Yes, sir. The city of Manchester, in England, is lighted exclusively by Cannel gas, or was at last advices, and Liverpool also.

Q. In regard to passing Newcastle gas through volatile oil in street lamps, where has that been done?

A. The application of volatile oil to increase the illuminating power of Newcastle gas has been carried out quite extensively in London recently.

Q. What is its effect on the light?

A. To increase the amount of light produced from a given volume of gas. The subject has been carefully investigated, and the reports of the officers connected with the gas lighting department of London have been published and can be referred to.

Q. Are you acquainted generally with the price of gas in England?

A. Only from the reports published annually by the companies, and through legal investigations of the company's affairs.

Q. How does the expense of making gas in England compare with the expense of making it here, taking into consideration the difference in the price of labor, coal, and so on?

A. The expense of making gas in any place involves a number of considerations. The first and most important one is that of quantity manufactured, the extraordinary price of coal, or the price demanded above the ordinary price, and the higher or lower price of labor. Other points are, the cost of the retorts used on the spot, and the cost of the fire bricks necessary in the erections. These items vary in different localities, and in making up the cost of gas, we have to take in view, and constantly consider, the particular locality. I have never had the immediate superintendence of any department of the gas works that would enable me to give those elements of the calculation from experience. I know what is the cost of gas in different places in England, as found in the published reports and private communications. There is a way adopted by engineers of roughly calculating the cost of gas, founded on the cost ascertained at a particular period, when the cost of the materials can be ascertained, and adding to that cost

the increased or diminished price of materials at the time of the calculation, and the allowance due to increased quantity produced. This matter of quantity, as affecting the price or cost of gas, is seen at once by the public, when the cost of production in the large works is compared with the cost of production in the smaller ones, and the price charged at the smaller works is always necessarily greater than that charged by the larger works. That rough estimate applies with tolerable accuracy in the determination of the cost of the gas in the works. The accurate cost can be found only from the books of the company.

Q. The question I asked tended to a comparison between the cost of gas in England and that made here, with regard to labor and so on; taking the proportion. Whether the labor, on the whole, is a material element.

A. If you will allow me to go back eight years I can state that the cost of production of gas in England, as compared with the cost of gas here, with the same investment, and the price of coal being the same, was in favor of the English manufacturer about one-quarter in the items of labor and salaries.

Q. How does the character of their labor compare with ours?

A. In the case of the works in and about London the money price paid for labor there is a little less than for the same amount of labor performed here.

Q. I mean, irrespective of the number of workmen.

A. The more intelligent labor here enables the manufacturer to produce his results through the aid of a less number of workmen; and, if my memory serves me, about one-sixth was the difference in favor of the English manufacturer.

Q. Have you made any calculation of the rate at which gas could be supplied to the city of Boston at a fair profit by the company?

A. I do not feel competent to answer that question fully. The same rough estimate may be applied. Taking the cost of gas as far back as ten years, and adding one half more for the cost of labor and expenses connected with the repairs, &c., a little estimate which I made gave the price of gas as from $2.40 to $2.50 per thousand feet.

Q. In Boston?

A. In Boston, supposing the production to be a million of cubic feet per day, for three hundred days in the year.

Q. Was that with or without a profit?

A. I have assumed a profit of ten per cent.

Q. Included in that?

A. Included in that. Six per cent as interest and four per cent as actual profit above the interest. And I also include the usual sinking fund for repairs. That is an estimate, made in that rough way, in order to approximate the price — the price having been asked. The true way unquestionably is, to submit a matter of that kind to the capitalist and the engineer, not to learn the cost, but the price at which the capitalist and the engineer will supply the gas, supposing that a company is about to supply a city, or that the works are to be erected by the city government.

Q. This estimate of yours assumes that the gas works are put up new?

A. Yes, sir; and I have added the fifty per cent advance upon the price of every thing connected with the work ten years since. I go back to that period, because I was then much better acquainted with the subject than I am at present.

Q. And you gave an advance of fifty per cent?

A. Yes, sir.

Q. Suppose it was not necessary to put up every thing new, but that you had the large mass of your investment bought years previous, before the question arose, such as land, buildings, pipes, &c., — whether or not this would reduce the price of the gas.

A. Certainly it would diminish the price, if the fifty per cent were not added, or if a portion of it only were added. There is a feature in gas manufacturing which is not seen in other manufactures exactly. What is true at one particular period of time ceases to be true in its different bearings at another. Gas works diminish their expenses as the increase of manufacture takes place, and we are compelled to assume a certain amount of gas manufactured in a given period in order to reach the price; and the increase is not in a regular ratio, taking a number of gas works in view; so that any statement of cost must be a general one.

Q. Have not scientific men, by taking certain given data, of expenses, made a system showing what the price should be, which could be applied generally?

A. That has been done, to some extent; and those reports which have been published are generally trustworthy sources of information on these points.

Q. Whether or not has the city of Boston certain peculiarities

which make it a city easy to be supplied with gas, in comparison with other cities?

A. It possesses an advantage over sparsely settled districts, inasmuch as the population is confined to a small space, rendering the employment of short mains sufficient for the general distribution of the gas.

Q. Is this a considerable advantage in regard to furnishing the supply?

A. It is a very great advantage.

Q. Do you know of any other city in the United States which possesses this advantage to an equal extent with Boston?

A. I do not, sir.

Q. I presume it is felt not only in regard to the extent of pipe, but also in regard to what is called leakage, and other matters of the kind, is it not?

A. Those all come in as parts of the system. There is a variation of level in Boston as compared with some other cities — Philadelphia, especially — calling for a little more engineering skill in the distribution of gas under an even pressure; but in point of compactness and readiness of distribution, I do not know of another city where gas is manufactured possessing these points of advantage so distinctly.

Q. Have not the improvements in engineering and chemical science during the past years tended to cheapen the manufacture of gas?

A. They have.

Q. Whether or not those improvements have been considerable?

A. They have been very considerable, as affecting the price at which gas can be sold by the manufacturer.

Q. Mr. Jewell suggests that you should give some particulars.

A. First, the introduction of clay retorts has greatly diminished the cost of the production of gas, insuring a better quality of gas from the same material used. The next step of advance is in the direction of economizing the products. What are termed in the gas manufacture secondary products have become articles of value, and almost every month brings us information of some new application of these products, increasing their value, and in the same proportion diminishing the cost or price of gas.

Q. How about what is termed leakage — whether or not that has diminished of late years?

A. A very great improvement in that respect has been made the world over, I may say.

Q. Can you give us some facts in regard to the proportion of leakage formerly existing?

A. I could give them from reports, rather than from my personal observation. The records show that the diminution of what is called leakage in London has been very great indeed, so as to constitute a part of the profit, as declared by the companies.

Q. What is understood by the term "leakage" in this manufacture?

A. It includes the diminution between the product measured at the works and that returned as the measurement sold.

Q. And this arises from a variety of causes, I suppose?

A. It arises from a variety of causes, as alluded to by Mr. Blake; but by far the larger loss has arisen from the defective method formerly pursued of laying the mains and smaller pipes.

Q. How does the number of feet obtained from Cannel coal compare with the number of feet obtained from Newcastle or Pictou coal?

A. The product in feet from a given weight of Cannel coal is considerably greater than that obtained from Newcastle coal, or coals of that class.

Q. Do you remember the proportion?

A. I do not. They are recorded so thoroughly in the works treating on the subject that I do not keep them in mind.

Q. And each foot of this Cannel gas, I think you testified the other night, represents more light than a foot of Pictou or Newcastle gas?

A. Yes, sir. The Cannel gas in England, compared with the Newcastle gas in England, is fifty per cent higher in illuminating power.

Q. Has the gas now used in Boston, as you have seen it, been open to the objection that it is too rich?

A. No, sir; not as now consumed in Boston.

Q. Whether or not when gas is tested at the factory it comes up to a higher candle power than it does when tested in the centre of the city, at a distance from the factory, and what is the proportion?

A. The gas at the factory is generally warm, and if measured directly from the apparatus there, and burned under the same conditions, it will indicate a higher illuminating power.

Q. Can you give about how many candles more, or what proportion more?

A. I have a record of that kind, but I cannot now state from recollection. It is always higher, however, than when taken at a point after it has become equalized in a gas-holder, cooled and finished.

Q. When gas is distributed in smaller pipes is a greater pressure needed than when distributed in large mains?

A. Certainly, if the same volume is to be transmitted.

Q. And does an excessive pressure increase the expense of burning to consumers?

A. It operates in the way of increasing the cost of the light, if burned under the high pressure. To place it more distinctly, if gas is burned under a pressure of two inches, in any form of burner, the illuminating power of the gas is largely diminished, as compared with the same volume of gas burned at a low pressure — a pressure of one quarter of an inch. The highest illuminating power of a gas is obtained when it is burned at the lowest possible pressure.

Q. What is the lowest possible pressure at the burner?

A. A pressure of quarter of an inch is sufficient to meet all the changes which may occur in the practice of burning.

Q. Are there scientific machines for regulating the pressure of gas issuing from holders?

A. Yes, sir.

Q. Automatic machines?

A. Yes, sir.

Q. In holders where gas is coming in and going out at the same time, can the pressure be regulated?

A. Yes, sir, if the adjustments are perfect, the pressure will not be disturbed. Supposing the gas is entering the gas-holder and being discharged at the same time, if the mechanical arrangements are perfect, the pressure will not be disturbed.

Q. How often is the quality of the gas inspected in Boston?

A. I cannot speak up to within a couple of years — two or three years; but formerly it was inspected every day, and several times each day.

Q. Reports made of it?

A. And reports made. I am not quite sure whether continued to the present day, but I think that they are.

Q. In your judgment, to insure the proper standard of gas in

the city, should not the gas be inspected every day, at different times?

A. I think it should be inspected every day for the satisfaction of the consumers, and the inspection would place the gas manufacturer on a more comfortable basis in his relation to the consumer.

Q. In your judgment, would it tend to the greater protection of the citizens if a disinterested person or disinterested persons should make inspections of the gas at several times each day, at different parts of the city?

A. I don't think that would be required. I think if the gas were tested by a competent person at any central point in the city, and by the usual well-known methods, the rights of both manufacturer and consumer would be secured so far as the quality of gas is concerned.

Q. And this should be made every day, you think?

A. Every day, or twice a day. The report would cover an average. I think that course is pursued by one large establishment, for its own information and benefit. It certainly was for many years.

Q. In your judgment, how often should meters be inspected, in order that they may remain correct?

A. I have no precise information on the subject. It involves the question of durability. I am not acquainted with that subject.

Q. Would the laying of a new set of pipes in the street cause any great disturbance or commotion, and what is the principal disturbance occasioned by having pipes in the street?

A. The laying of the pipes of a new company through the city might be carried on at night, so as to disturb the traffic but very little. A proposition has been made to lay the pipes beneath the sidewalks, upon each side of the street, rather than under the pavement of the street itself. In that case, I think the work of laying the pipes would interfere with the public convenience to a very slight extent, and for a short time only.

Q. I desire to know, also, whether the repairs made by the old company in the street, — necessary repairs, — would not occasion quite as much disturbance as laying down pipes in the way which you have mentioned?

A. Where the old company is increasing its business from year to year, the frequent substitution of pipes of larger diameter

becomes a necessity; and the number of repairs required is very much greater after a company has been in existence ten or fifteen years than at an earlier period of its history.

Q. Do you know what proportion the cost of the coal bears to the cost of the gas?

A. I have never estimated it in that way, sir, and I cannot answer the question directly.

Q. What is the difference to the consumer between using gas at a pressure of half an inch and three inches?

A. I cannot give the precise difference, but under a pressure of three inches, there would be a large loss of illuminating power, for the volume of gas burned. Or, in other words, there would be a positive waste of gas.

Q. Do you know what the pressure is over the city now?

A. I do not, sir.

Q. (by the Chairman). Do you know what the charge is for gas by the companies in London or Liverpool?

A. As reported, only. One of the late reports states Newcastle gas at four shillings sterling per thousand feet.

Q. Is not Cannel gas the best for the consumer?

A. It is, sir.

Q. In every respect?

A. In every respect that I know of.

Q. Both as regards the health of the families that have occasion to use it, and on the score of economy?

A. It possesses several advantages. In the same amount of light, there is much less heat, and heat is sometimes a great objection.

Q. To get the same amount of light from common gas, you must increase the quantity?

A. You must increase the quantity you burn, and you never obtain the same light. Then, in burning the common gas, you have to pay for a larger quantity of gas than you would have to pay for of Cannel gas, in order to obtain the same amount of light. Nearly fifty per cent more passes through the meter to produce the same amount of light.

Q. (by Mr. Stackpole). Do you term the gas we use now Cannel gas?

A. I don't know what it is now: I only know it from the pub-

lished reports, and from some trials made of it five or six years ago, when I was not trying the gas with reference to its value, but comparing it with other illuminating materials. The published reports give it at about seventeen candles, when it is burned under the most favorable circumstances for the gas. That represents it below any Cannel gas with which I am acquainted.

Q. (by the Chairman). In order to arrive at a correct knowledge of the quality of the gas and the pressure, it is necessary that the city should have a constant inspector of the gas in regard to both points, pressure and quality, is it not?

A. If those points are to be determined, then necessarily there should be an inspector.

Q. If we had a city inspector here, could he not impart a good deal of knowledge to the citizens, in regard to the different kinds of burners to be used, the different modes of economizing the gas, and so on?

A. He certainly could, if that were made a part of his duty.

Q. Have you any knowledge in regard to the lawsuits that are constantly pending between the gas companies and the water companies in London?

A. Only from reading the published accounts.

Q. In your opinion, would it be a disadvantage to the sanitary condition of the city to increase tbe number of gas companies in the city by allowing them to lay competing pipes through our streets?

A. I think that subject would present two distinct features. Competing companies may divide the territory of a city without any increase in the number of pipes, or they may run over the whole city. I believe experience has been, that wherever competing companies pass over the same district, inconvenience is produced to the population of the city. Where they divide the territory, as they have done in several of the American cities, none of that inconvenience is felt.

Q. Is it not your experience, that when competing companies are brought in contact with each other, they in a short time agree upon a certain tariff of prices between themselves, in order to carry them up to such a point as they wish?

A. I am not acquainted with that feature. It belongs rather to the traffic in gas than to the manufacture. There was such a case occurred in Brooklyn.

Q. (by Mr. Stackpole). I asked you with regard to the methods of estimating the price of gas, taking certain proportions. I see here an article in the "American Gas Light Journal," called "The Constants of Gas Engineering." Have you read that article?

A. There are several of those articles. I have read them as they have appeared in the periodical.

Q. Do you know whether or not the estimates in those articles are to be depended on?

A. I think they accord with the opinions and experience of gas engineers.

Adjourned to Monday evening, at 7 1-2 o'clock.

MONDAY, Nov. 26.

The Committee met, agreeably to adjournment, and the direct examination of Dr. Hayes was resumed.

Q. (by Mr. Stackpole). Does the flame of camphene cast a stronger light than that of gas?

A. No, sir.

Q. Will you state the philosophy of that?

A. Camphene, when burned from a wick or burner, affords a small flame, and when measured by the proper apparatus, it falls below, in illuminating power, the standard of good coal gas, and more especially of kerosene oil.

Q. Have you had any practical experience of this?

A. I have, sir.

Q. Will you explain the diffusion of the light of gas?

A. The term is used to express the action of a large flame. A large flame of moderately illuminating gas lights a certain space, and under a regular consumption, we will say five feet of gas, the space is moderately lighted, if it be a large one, and the power of the light, measured at a considerable distance from the burner, is small. If, on the contrary, the flame of a highly illuminating gas be made equally large, the light afforded is one-half greater than that afforded by the less luminous flame. Now, as that part immediately about the burner is more highly illuminating, it is often stated that the light is not so well diffused, while the diminution of light at a given distance is precisely the same in each case, and in accordance with a great natural law, to which there can be no exceptions adduced.

Q. Does gas made from Pictou coal cast a light to a greater distance than Cannel gas?

A. When the two flames are brought to the same amount of light, near by, — that is, to the same measure of light, — each casts precisely the same amount of light to a distance. When the Cannel flame proves more highly illuminating than the Pictou gas flame, it casts more light to a distance, just in proportion to its illuminating power.

Q. Does Cannel gas, when properly used, smoke?

A. No, sir. When properly manufactured and used, it does not smoke.

Q. In your judgment, can the gas we are now using in the city of Boston be properly called Cannel gas?

A. Not when it falls to the standard as stated by the official examiner.

Q. About how many candles?

A. It is stated about sixteen candles. Cannel gas never falls below twenty candles, and may be very much above it.

Q. Does the price of coke rise and fall with that of coal, so that when coal is dearer, coke is dearer also?

A. Generally.

Q. How much coke does a ton of coal yield? and how much is necessary in the manufacture of gas?

A. A ton of coal yields different amounts of coke, varying with its quality. A ton of Pictou coal, that is, two thousand pounds of Pictou coal, yields 1,400 pounds of coke. In the manufacture of gas, from 20 to 25 per cent of the whole product is consumed in the carbonization, as it is termed, of the coal.

Q. What difference in the profit on gas would the use of clay retorts make over iron?

A. Clay retorts enable the manufacturer to produce gas at a very much lower cost than it can be produced from iron retorts; not from an inherent difference in the material of the retort, but in the economy of using the more permanent apparatus, over that which not only is not permanent, but subject to great uncertainties in the manufacture.

Q. Can you state any measure of profits?

A. There have been cases where the substitution of clay retorts for iron retorts in use has enabled the company to make dividends which they could not earn with their iron retorts. I

believe clay retorts are universally used in the best gas establishments.

Q. Will you state whether, since the building of the present gas works in the city of Boston, any improvements have been made in the manufacture of gas?

A. Improvements have been made during the past years in the manufacture of gas, in its purification and in its distribution, and up to within quite a recent time. Almost daily, improvements are being made.

Q. Has there been any improvement in the manner of disposing of the tar, as a residuary product?

A. Tar, and the other secondary products, as they are termed, of the gas manufacture, have risen in price, owing to an increased demand, growing out of an increased number of applications in the useful arts; and the secondary products of a gas work now form an important part in the value of the products obtained from the coal.

Q. In the early history of the manufacture of gas, could the tar be disposed of at any real, substantial price?

A. In the early history of the gas manufacture, it was wasted. The value of it has been increasing, I think, almost yearly, since that time.

Q. In your judgment, what would be the best plan in putting up new works, in respect to the number and size of the mains?

A. I gave as a reply the other evening, that the distribution of the gas could be easily effected from the station where all the gas is manufactured, and that such a mode of distribution involved the use of large mains. These are required, and secondary mains to cross them are also required in that mode of distributing the gas.

Q. Whether or not that would be more expensive than by putting up large gas-holders in different parts of the city?

A. I think not nearly so expensive as the erection of gas-holders at different points and maintaining them.

Q. Are the pipes laid down in this city at the time the Gas Company was instituted, sufficient to supply it without a very great increase of pressure?

A. The gas works of this city were first established on a small scale and with small mains. With an increased production of gas, those have proved insufficient; and without any positive knowledge on the subject, I suppose that others have been placed as substitutes for them.

Q. In your judgment, for the proper protection of the consumer, should any gas-meter be allowed to measure until properly inspected?

A. No, sir; gas-meters should be inspected at the moment that they are placed, or previous to their being placed.

Q. (by Mr. Hyde). Beyond the question of price or cost, is there any difference in the distribution of the gas, whether you have gas-holders and store it, or distribute it through large mains?

A. It is supposed in both cases that the gas is stored. I think it becomes a question merely of storing in one place or storing in another. If gas be stored at the works, then larger mains are required for its distribution than would be required if gas-holders occupied different points about the city. I don't think those gas-holders act as regulators of the flow of the gas. There may be some in this city that are so constructed, but generally they are constructed merely as store-houses of gas, and they require mains leading from them to the section where each gas-holder is to deliver its gas. The same arrangement can be made where the gas-holders are massed together at the works.

Q. Will gas be as well distributed if the mains are large, where you have to carry it a great distance, as though you had gas-holders at intermediate points?

A. Quite as well distributed.

Q. (by Mr. Stackpole). Can you regulate the pressure as well without holders?

A. The pressure is not exactly regulated by holders. It is true, they are worked under a given pressure generally, but that does not regulate the pressure over the city. Another instrument is used in the work for regulating the pressure, and that is called "the governor."

Q. That is the automatic machine you have already described?

A. I think I referred to it as an automatic machine, which regulates the pressure, and is especially necessary where there is a difference of level in the distribution of the gas.

Q. Where the pressure is not regulated in this way, is it in the power of consumers to regulate their pressure by turning the cock immediately at the gas?

A. They shut off part of the pressure, but they burn the gas under uneconomical conditions.

Q. Will you state why?

A. The gas, arrested in its progress, becomes diminished in its gravity, and flows out from the burner in a condition to mix with more air. To render the explanation more clear, I will state, that as we mix gas with air in a regular proportion, we obtain the full measure of its illuminating power. If the proportion of air mixing with the gas at the instant of combustion be increased beyond the point necessary, there is a diminution of illuminating power taking place, until, under a particular arrangement, nearly the whole light can be destroyed. When the gas escapes from the pressure near the tap, each valve interposes merely a wire-drawing process; the gas which passes through the burner is then fitted to burn with too large a body of air, and we lose an economical action.

Q. (by the Chairman). Prof. Silliman says, in a letter—"My motive for using Sterling's Regulator was chiefly to find a remedy against the irregularity in pressure at my house, which is over a mile and a half from the works, for the gas, if it passed from the factory with a pressure of from three-quarters of an inch to an inch, would gauge two and three-quarters inches, causing great inconvenience in the management of the lights. It has entirely relieved me from the trouble arising from fluctuations in the pressure, giving a steady and uniform light, and has been a saving to me in my gas bills of near fifty per cent." Could he have saved that amount of gas, in his consumption in his family, if he had not had the advantage of that Regulator, simply using such control as he might have over the faucet, in turning it near the burners?

A. I should take his statement of the saving, without knowing that it was positively so great; but there is no doubt whatever, of a very large saving being effected by the gas being delivered under an equable pressure, and that a very small pressure, to the different burners in a building. The apparatus called "Sterling's Regulator" there is but a miniature form of the apparatus used in the large gas works for regulating the gas over the city, or over any extent of territory where it is distributed.

Q. (by Mr. Stackpole). To go back to the subject of Cannel and Newcastle gas, which consumes the most oxygen in the air, Cannel or Newcastle gas?

A. Newcastle gas.

Q. And which produces the greatest amount of carbonic acid?
A. Newcastle gas.

Q. (by Mr. Hyde). One question upon this matter of pressure. Can a gas company control the pressure over a large city, so as to make a proper pressure at the different hours when different quantities are burned, to furnish the best light, with an economical consumption?

A. I don't think that possible, without the use of Regulators, that is, "Governors," as they are called.

Q. How far is it possible, with proper "Governors"?

A. I think that, with the proper capacity of mains, it would be possible to do that effectually. I know that almost all cases that may be cited prove that the mains are too small in our cities, for the reason that a very large number of taps are opened within one hour, and consequently the supply at any given time, at a distant point, cannot be rapid enough to supply that momentary call upon the gas-holder. But there is no difficulty whatever in having the pipe large enough. Consumption generally outgrows the arrangements made for the supply.

Q. To put an illustration; take, for example, the gas of the city all burning, we will say, at ten o'clock, and the distribution to be equal to the supply, with a pressure about right, then that three-quarters of the burners are turned off, the pressure remaining the same, — that is, not turned off at the gas works, — what would be the per cent of waste?

A. I cannot give it exactly, sir. It would be very large, every light burning with smoke, as is observed now in various parts of the city. A "Governor" applied to the pipes regulates that in a very short time. As soon as the impulse can be felt at the "Governor," it regulates that diminished consumption, and brings it down to the proportion required.

Q. Would the waste be a third or a quarter, in general terms?

A. If the light passes the point of illumination, and becomes a smoky light, as it often does, you lose three-quarters, fully.

Q. Do you know whether there are any "Governors" or Regulators upon the gas works in this city?

A. I do not, sir.

Q. (by Mr. Stackpole). In your judgment, in what lies the hope of cheaper gas for this city?

A. The establishment of works on a large scale, so as to include, if possible, the supply of the smaller cities adjoining; works constructed on the most economical and improved principles, and embracing all the recent improvements in gas manufacturing, either managed by a company chartered for the purpose, or controlled by the City Government. In the latter case, I suppose the gas would be delivered at a lower price to the consumer, making the whole difference which a private company would charge.

Q. If gas is supplied to consumers by the city, could not the price be reduced by erecting the works outside the city limits?

A. Certainly, sir. I should advise that the works be erected outside the city limits.

Q. And even if the works were at some distance from water, would it not be practicable, by landing the coal at a wharf, to carry it to the works without any great increase of expense?

A. That course is adopted now very frequently, and where the cost of the site is considerable, it is the most economical course.

Q. (by the Chairman). Have you knowledge of what the gas cost when you were the chemist of the Boston Gas Co.?

A. No, sir. I have seen the cost stated by the Boston Gas Light Co.

Q. (by Mr. Hill). In what locality, outside the city limits, would it be desirable to place the gas works, in case the city should conclude to furnish its own gas?

A. I cannot answer that question. It would be one requiring a good deal of examination and consultation with gas engineers.

Q. (by the Chairman). Would you take the gift of the best dwelling-house there is in Boston, located within a hundred rods of any gas works, and be obliged to live in it with your family?

A. I certainly should not choose that as a place of residence, and I do not know that I should accept a house under those conditions.

Q. You would consider that to locate your family near gas works would be a cause of detriment to their health, wouldn't you?

A. I should hardly put it on the score of health, so much as inconvenience and annoyance.

Q. You would consider it a great damage to the value of real estate in the neighborhood, wouldn't you?

A. I think a gas work may be placed on the same basis as a large iron manufacturing establishment in that particular, and I think that any reply would be the same for each of those establishments.

Q. It is stated that a hundred thousand hogsheads of water are used in the Manhattan Gas Works, in the city of New York; that those hundred thousand hogsheads are emptied into the river, and this water being allowed to flow into the river is pronounced an absolute nuisance to the citizens of New York. Is not the same effect produced here?

A. I do not know, sir. I have not visited the Boston Gas Works for more than eight years. I do not know what is the present mode of manufacture.

Q. Have you any knowledge of the quantity of water they use in twenty-four hours?

A. No, sir. At the time that I was connected with the works, they used a considerable quantity of water, but how much, I do not know.

Cross-examined by Mr. Curtis.

Q. I understood you to say, that about ten years ago, the Gas Company availed themselves of your services as a consulting chemist?

A. Yes, sir.

Q. The special object for which you were consulted was to obtain the most productive compound of coals in the making of gas, was it not?

A. No, sir; improvements in the manufacture of gas.

Q. General improvements?

A. General improvements, I believe, sir; and that was a very important object, that of the mixture of coals making up the charge introduced into the retort.

Q. And also improvements in the methods of purification?

A. Yes, sir.

Q. You arrived, I suppose, by experiment, at what you considered to be the best mixture?

A. Yes, sir, so far as the experiments were continued.

Q. And that mixture was, as you have said, composed of Pictou and Albert?

A. Yes, sir. Of the coals that we could make choice of, the best gas was produced from a mixture of Pictou and Albert.

Q. That gas, in those days, I understood you to say, ranged from 17 to 20 candles?

A. It was higher than that, sir.

Q. Did you conduct photometric experiments?

A. I did, sir.

Q. By what apparatus?

A. I used several kinds of apparatus. The Bunsen photometer, as improved by the English observers, was the basis of the experiments.

Q. Did you not make use of a photometer known as the Ritchie-Hayes photometer?

A. I don't know of any instrument by that name. I made use of a reflecting instrument, the principle of which was the diminution of light reflected from two given sources. It was an instrument changed from the basis of the Ritchie instrument.

Q. By yourself?

A. Yes, sir.

Q. Where were those experiments made?

A. They were made in my house, about centrally situated in the city, and experiments were made daily, almost, at the works. In these experiments, I used a variety of instruments. It required some little time to fix upon that which was best and most perfect.

Q. Did you finally conclude that this reflecting photometer, with your improvement, was the best?

A. It was the best for the purpose in view. It was so arranged that the light fell upon a printed page, and as at that time there were great complaints of the illuminating power of the gas, it was possible to convince any person objecting, of the quality of gas in that way better than by allowing him to observe with the instrument of Bunsen, as generally fitted. The comparison between this instrument and the best Bunsen instrument was kept constantly in view.

Q. Then, so far as I understand, the Hayes instrument was better adapted for common purposes, and Bunsen's for more accurate scientific purposes?

A. No, sir; the instrument I used was quite as accurate, even more so, than Bunsen's instrument. It would show a slighter variation in illuminating power than Bunsen's instrument.

Q. Did any one else use your instrument, or a similar one?

A. Not to my knowledge.

Q. Do you know that the use of that instrument has been abandoned by the Boston Gas Light Co.?

A. I don't know any thing of their using it at any time. I don't know that they have ever used it.

Q. Do you know that the results of that instrument vary from the standard Bunsen?

A. I know they agree precisely with it, and allow of even nicer gradations than the instrument of Bunsen.

Q. Do you know that it is the general opinion of scientific men that they do vary?

A. I don't think it is the general opinion, for I know of no scientific man having tested this instrument.

Q. What, if you recollect, was about the proportion of Pictou coal and Albert that you determined to be about right?

A. I have registered as the best proportion a mixture of dry Pictou coal 100 parts, and ten parts of Albert coal.

Q. That is, one-eleventh of Albert coal?

A. Yes, sir, one-eleventh.

Q. Are you acquainted with what has been called the Lingan coal?

A. I think it was one of the coals I experimented upon at the Boston Gas Light Co's works.

Q. Are you acquainted with the properties of the Lingan coal now?

A. I hardly dare to trust to my memory to state positively what they were; but in experimenting upon the Lingan coal, the conclusion was that it corresponded closely to the Pictou coal. I think it contained more sulphur, and gave a little finer coke.

Q. The sulphur is easily removed by purification?

A. It is removed by purification.

Q. Did it show a higher illuminating power?

A. I think not. I think it was about the same illuminating power as the Pictou coal.

Q. Do you know of any higher class of Cannel coal, or any coal producing gas of a higher illuminating power, than Albert coal?

A. I do not.

Q. Do you know of any company in this country that uses it except the Boston Gas Light Co.?

A. I don't know positively of any one using it.

Q. In point of fact, is the Albert coal properly called a coal? Is it not something of a higher grade, a superior quality to all coals?

A. I consider it as one of the highest grades of Cannel coal.

Q. Is it not the highest?

A. I should hardly place it above the two varieties of Cannel. The Boghead Cannel is equally high, I think, in this connection.

Q. You say you have not been intimately or personally acquainted with the manufacture of gas since you left the Boston Gas Light Co.?

A. I made no such statement, sir. I said that I had not been acquainted with the operations at the Boston Gas Light Co's works.

Q. Then, confining it to this city, you have not been practically and personally acquainted with the manufacture of gas in this city?

A. No, sir. It is more than eight years since I was at the Gas Works.

Q. Have you been practically and personally acquainted with the manufacture of gas in the city of New York since that time?

A. I think that I have not been practically acquainted with the manufacture there since about that time; but I have visited the works, and examined special points connected with them, as I have other works.

Q. Have you visited the works in Philadelphia?

A. I cannot say accurately how lately.

Q. Have you visited any works in England?

A. Not since 1858 in England.

Q. Not in London?

A. No, sir.

Q. Nor in Paris?

A. No, sir.

Q. You spoke about gas having been transmitted by one of the London companies eight miles?

A. No, sir: I said four miles before the pipe was tapped, and I said it was the Great Western Co. They pass their gas more than eight miles.

Q. I suppose they pass it twenty-five miles, at least.

A. Yes, sir; but we speak here of the main pipes of distribution. They are more than eight miles long.

Q. Where are the works of the Great Western Company?

A. At Kensal Green.

Q. Have they a station elsewhere?

A. Not to my knowledge.

Q. What company was it that you stated supplied the Bank of England?

A. I didn't name any company as supplying it. I only stated that they were using Cannel gas.

Q. Do you know how far it is carried?

A. I do not, sir.

Q. Do you know that there is a station of the Company that supplies it within three-quarters of a mile, in the heart of London?

A. I don't know but there may be a station supplying that gas.

Q. Manufacturing and supplying it?

A. I have no knowledge of the origin of that gas, but of its being consumed there, as they could not consume, economically and comfortably, the gas made from Newcastle coal. An attempt was once made at the Bank to add illuminating power to the Newcastle gas, and after that attempt was abandoned, Cannel gas was introduced, to take the place of this naphthalized gas.

Q. Do you know that that gas is manufactured about the centre of London — about three-quarters of a mile from the Bank?

A. I don't know where it is manufactured. I have no knowledge of it. I know that several of the Companies, at that time, manufactured Cannel gas.

Q. Do you know that there is a manufactory of gas within half a mile of the Parliament House in London?

A. I think one of the works is quite within that limit; but it is in one of the lowest parts of London, and a section devoted to establishments of that kind.

Q. How does that affect the question whether it is detrimental to the health of the occupants of houses in that part of London?

A. Not at all. This section of London is devoted to works of that character. When I spoke of that as a low part of the town, I referred to the character of the works carried on there.

Q. Is not that about a quarter of a mile from Buckingham Palace?

A. I don't remember the distance from Buckingham Palace, nor can I conceive of any possible connection between the two things. The works are located nearly where they were started, very near the river, and have grown up there, and other works of

a similar character have grown up around them. The distance I do not remember from the various points in London to those works.

Q. Are you acquainted with the locality of the works in Paris?

A. No, sir. I do not recollect their location. I simply passed the works in Paris while I was there.

Q. How did you pass them, on foot, in a railway train, or in an omnibus?

A. The works in Paris I visited by carriage, I think. I do not recollect their distance from nor their position in regard to other buildings at all.

Q. You have spoken of the use of clay retorts as having been adopted in Paris, and by nearly every gas company of distinction.

A. Manufacturing on a large scale.

Q. How do you arrive at your knowledge of the use of clay retorts in the city of Philadelphia, for instance?

A. I have no precise knowledge of their having been adopted in Philadelphia.

Q. I misunderstood you very much the other night, then, for I understood you to say clearly that they had been adopted there.

A. I think not, sir.

Q. Can you state any other place where you have precise knowledge that they are used at the present time?

A. Not from observation; for, as I said, I have not visited any works within a short time. The last time that I was at the New York works, some three years ago, they were using clay retorts, and with very great advantage. My information in regard to clay retorts is derived entirely from another source than observation. I have taken the statements of gas engineers best acquainted with the subject, who have had them in use.

Q. Who are they?

A. Well, take the late Alexander Wright as one. Mr. Barlow, who is at the head of the Gas Light Journal, and of the gas light interest, I may say, of London, agreed with him. I will name two others, if you please, because they are persons whose opinions are entitled to great weight in this community — the manager of the Manhattan Gas Works at New York, Mr. Sabbaton, and Mr. Charles Roome, the President of the Company, both practically acquainted with economical gas manufacture.

Q. What we want to get at is your personal knowledge, which enables you to state these facts.

A. My personal knowledge in regard to clay retorts is derived

from about ten days' use and supervision of them in the Great Western Works in London. I saw them there in use on a large scale for the first time.

Q. How long since?

A. That was some eight or nine years since.

Q. That was ten days' experience?

A. I was there ten days, and had the benefit of the information of the Resident Engineer, Mr. Evans, on the subject, and of Mr. Wright's more extended experience.

Q. Do you know of any reasons that operate in favor of the use of clay retorts in London or in Paris, for instance, that do not apply to this locality?

A. No, sir.

Q. None in respect to the quality of coals used in Paris, for instance?

A. No, sir. I don't know how any connection between the coal used and clay retorts can be found.

Q. Do you know what coals are used in Paris?

A. I do not.

Q. It is possible that the coals used in Paris with clay retorts might bear the effect of high heats, whereas the coals used in this country would not show good results from that treatment.

A. I should adopt no such conclusion.

Q. It is possible, I say.

A. No, sir.

Q. Not possible?

A. No, sir.

Q. Do you know if it is possible to use Pictou coal in New York with clay retorts?

A. I know it is possible.

Q. Do you know that they do it?

A. No, sir.

Q. Do you know if they have tried it and abandoned it?

A. No, sir.

Q. Do you know whether they have tried clay retorts in the city works at Philadelphia and abandoned them?

A. I do not, sir.

Q. Do you know that clay retorts have been tried by the Boston Gas Light Company and abandoned?

A. I do not know that they have tried them, nor do I suppose their works fitted for using them.

Q. You have never compared, scientifically and personally, the results of working with clay and iron retorts, except in London?

A. No, sir.

Q. When coal is carbonized at a heat of the retort above cherry red, does it improve or injure the value of the gas produced?

A. That depends a good deal upon the nature of the coal. The term "cherry red" is a very indefinite one.

Q. I understood you to say just now that it did not make any difference what the coal was; that you could not conceive the possibility of any connection between the kind of coal and the use of clay retorts.

A. You had no reference whatever to temperature.

Q. I was talking about the use of clay retorts.

A. And my reply in reference to that was, that the clay retort was adapted to any kind of coal that could be used in an iron retort.

Q. Now, if coal is carbonized at a heat above cherry red, I understand you to say that it depends upon the coal whether it improves or injures the quality of the gas produced.

A. Some coals will bear a much higher temperature in their carbonization than others.

Q. My question is, whether the quality of the gas is improved or injured. When coal is carbonized at a heat of the retort above cherry red, does it improve or injure the value of the gas produced?

A. That depends upon the nature of the coal. Some coals will bear a much higher temperature in their carbonization than others, and the skilful manufacturer regulates the temperature of his retort so as to adapt it to the production of the best quality of gas from a given kind of coal; and with the clay retort, this is a practical operation much more easily effected than with the iron retort in use.

Q. Is not the chief recommendation of the clay retort its ability to sustain a higher degree of heat than the iron retort, and for a greater length of time?

A. Its durability is its greatest recommendation.

Q. My question was, whether its chief recommendation was not, its being able to sustain higher degrees of heat, and for a longer time?

A. I don't think that the higher degrees of heat come into the calculation at all. The retort is not supposed to be overheated in

any case. The clay retort can endure the same amount of heat which is requisite in the iron retort for a much longer period; it is, therefore, a more durable retort.

Q. Is not one of the objects of using a clay retort to enable the manufacturer to employ a very high degree of heat?

A. No, sir; a high degree of heat would be very detrimental in the manufacture of gas.

Q. Did you ever see a bed of clay retorts, either in England or anywhere else, in actual use, at a lower heat than orange red?

A. I have seen beds of retorts in use at the heat best adapted to produce the result. The exact temperature I could judge of only by the result produced.

MR. CURTIS. That is a very interesting statement, but I believe it is not an answer to my question.

MR. STACKPOLE. I understood the witness to say, that the terms "orange red" and "cherry red" are very indefinite.

WITNESS. The terms "orange red" and "cherry red" are so indefinite that no two persons will agree in regard to the temperature they indicate.

Q. Have not the clay retorts that you have seen exhibited a very high degree of temperature?

A. No, sir.

Q. Do not the clay retorts crack from sudden changes of temperature, causing great fissures in them?

A. Clay retorts often crack when the temperature of the furnace is reduced when they go out of use, unless care is bestowed upon them.

Q. Do you know whether there is any great difficulty experienced in keeping these clay retorts whole?

A. No, sir: there is no difficulty experienced in keeping them whole. I was very much astonished at the ease with which they were kept tight.

Q. By plaster?

A. By the use of the same material. The retorts that were in use were twelve feet in length, and it seemed a practical impossibility that in the varying temperature of the furnace they should

be maintained perfectly tight; but yet that was the fact, and the serviceableness of the retorts continued.

Q. Then the amount of it is, that they do break, but are kept tight by the occasional application of the same material, to stop the cracks?

A. On the first heating of a bed of clay retorts, some of the retorts separate at their junction.

Q. And when that takes place, is there not a large escape and loss of gas?

A. No, sir.

Q. (by Mr. Hyde). At what temperature is gas best produced?

A. As I have before stated, it varies somewhat with the kind of coal used. We cannot fix the temperature precisely, but we measure it in the manufacture of gas by the quality of the gas.

Q. What range does a retort pass between, in the manufacture, ordinarily?

A. Confining my remark to a clay retort, it is a massive structure, taken in connection with the heated furnace, and when the charge of coal is first deposited in it, the temperature is not practically lowered, from the massiveness of the structure, so that very nearly an even temperature is maintained. The exact temperature which is maintained cannot be given. It is beyond any of our means of measurement, and we are obliged to rely upon these observations that have been alluded to, of "cherry red" and "orange red." But they are indefinite. They are well known to the persons who are using the retorts at the time.

Q. Then there are no degrees of Fahrenheit that can be specified?

A. Not accurately, for any kind of coal.

Q. (by Mr. Curtis). You said, doctor, that you thought, from the result of an estimate that you had made, that gas could be produced at $2.40 or $2.50 per thousand feet.

A. I did. I expressed my opinion.

Q. Will you give the items that go to make up that estimate?

A. No, sir, I cannot give them to you at present. In expressing that opinion, I stated how it was formed, in the direct examination, and I will state further, that it is the course which would be adopted by the best gas engineers.

Q. Will you state once more how it was that you arrived at it?

A. By taking the known cost, or price, if you please, knowing the percentage of profit at a given rate of production, and the price of coal, the investment in iron, and the price of labor; and adding to that the difference between the price at that time, and the price at this time.

Q. Which will you take, the cost or the price?

A. It is of no consequence, in a matter where we know what the percentage divided is, as we do in the English companies. You will find the course related at length in the Parliamentary trials, and also in the works on gas manufacture.

Q. Now let us confine ourselves to the manufacture of gas in Boston, or in Massachusetts, because we manufacture gas under very different conditions from those existing in England. Will you state what well known cost you adopted as a basis?

A. The price at which gas could be delivered here at one time, with a profit of ten per cent, was two dollars.

Q. When was that?

A. I don't recollect the date. Now, as the increased production of gas diminishes the cost, that may be reduced to a dollar and eighty cents.

Q. But in what length of time? We want to get at the relative amount of production, and in order to do that, you must fix some time when you start with the two dollars.

A. I don't recollect the date at which gas could be produced and sold here for that price, but I believe you can refer to it very easily.

Q. But is not your time an essential element in your calculation?

A. Not at all. In the cases of the English gas works, I could go back eight or ten years. If we know the cost, it is a matter of no consequence when that cost was the element chosen.

Q. Are there no counterbalancing circumstances to be taken into consideration in estimating the cost of gas here in Boston, that do not exist in England?

A. Certainly, there are a great many, and we take those in view.

Q. Then let us start with a basis here in Boston, and will you state where you began with gas at a cost of two dollars?

A. I began at the date when the company were furnishing it, I think, at $2.00; if not, at $2.25. It could have been furnished at that time at $2.00; there is no doubt about that. We take that

cost, and then make a deduction from that which will cover the increased production.

Q. What is the increased production between that point and the present?

A. The increased production is about fifteen per cent on the time elapsing.

Q. That is, the number of consumers has increased fifteen per cent?

A. The consumption of gas, without reference to the number of consumers. You can arrive very easily at the mode of estimation. I will take the production at 750,000 cubic feet per day, and increase it to a million cubic feet. I now deduct from the cost of the gas, on that increased production, about twenty cents, if my memory serves me, which brings the gas down to $1.80. Add now the increased cost of materials, as nearly as I could ascertain them, from a rough calculation (which I stated it was), and it brings the gas to about $2.40.

Q. Will you state what those materials were?

A. Iron was one of them. The increased price of iron, and the increased cost of labor.

Q. Can you state any one material that has increased in value only fifty per cent?

A. Coal.

Q. How is it about iron?

A. That has increased more.

Q. One hundred per cent?

A. In making this calculation, I go away from the Boston Gas Works, if they are using iron retorts; I do not know that they are. The manufacture of gas from iron retorts is one system, and from clay retorts another; and I refer to the manufacture from clay retorts, supposing of course that those would be used in an economical arrangement.

Q. What was coal worth then?

A. Five dollars. The quantity that could be bought for five dollars then could be bought for seven dollars now.

Q. Pictou?

A. Yes, sir.

Q. It has to be paid for in gold, does it not?

A. There is no question about the price at which that coal can be delivered here.

Q. There is a government duty on it, that has to be paid in gold, is there not?

A. It has a price in the market, to which I allude.

Q. Does not lime enter into the manufacture of gas, in large quantities?

A. No, sir.

Q. Not in purification?

A. No, sir, not in large quantities.

Q. In tolerably large quantities?

A. It is a very trifling charge in the manufacture of gas. It amounts to about two cents a thousand feet.

Q. Has it not increased more than 100 per cent in cost?

A. No, sir. There is a gas work just over the line supplying itself with lime, at just about the price it formerly paid. I allude now to the Roxbury works. They make their own lime on the spot, as any gas work using a large quantity would, I suppose.

Q. Is that shell lime?

A. Yes, sir.

Q. How is it about bricks?

A. They are more expensive.

Q. I suppose you have been guided more, in making this estimate, by the expense and cost of gas in other cities, — in Philadelphia and New York, — as shown by the reports?

A. No, sir, not strictly by those. I have paid no attention to the reports of the companies; I have had other sources of information.

Q. Are you able to state what the result of the manufacture in Philadelphia for the past year by the city has been — whether it has been profitable or not?

A. I cannot say.

Q. I would like to have you look at that report [31st Report of Trustees of Philadelphia Gas Works], and see if you can find out the cost of manufacturing gas there.

A. I should like to ask the question of those in the management. There are very great expenses often incurred in a gas work that should not be charged directly to the production of gas for any definite period. I don't know how they make up their accounts in Philadelphia. With few exceptions, as reported in this country, they are certainly not so simple as the English reports.

Q. They get coal there, I suppose, for a less price than we do here?

A. I don't know that, sir.

Q. You were speaking about putting main pipes under the

sidewalks. Were you aware of the fact that the Boston Gas Light Co. have been obliged to move all their pipes from under the sidewalks?

A. I was not aware of the fact. I don't know that that would make any difference whatever in planning a work. It would be planned with reference to supplying the gas in the most economical manner, and if any objection were urged to disturbing the roadway, the gas pipes could practically be laid under the sidewalks.

Q. You don't know any other objection to laying them under the sidewalks than the disturbance of the roadway?

A. There might be some objection by the authorities of the city, but there is no objection, so far as engineering is concerned.

Q. What size mains would you lay under the sidewalk?

A. I should calculate with great accuracy the size of the mains, depending upon the amount of gas to be transmitted to a given point.

Q. The object of what is called pressure is to make it certain that everybody in the city of Boston, for instance, where there is great difference of level, is supplied with gas under all circumstances, is it not?

A. Pressure is required to transmit the gas.

Q. To make it flow?

A. To make it flow to distant and various points.

Q. In regulating or establishing the amount of that pressure, you are obliged to take into consideration the fact that at any moment in the twenty-four hours, you are bound to furnish your customer with gas?

A. Yes, sir.

Q. So that, in the first place, you must calculate at the works what amount of pressure will be required to transmit that gas properly to the Roxbury line?

A. In the case of the Boston Gas Works, yes, sir.

Q. And in the second place, to provide the proper amount of pressure at the maximum degree of consumption in every twenty-four hours?

A. Yes, sir.

Q. Now, where you have a city like Boston, with a great variety of level, does not the multiplication of gas-holders enable you to regulate and equalize that pressure as well as a gas-regulator at the works?

A. No, sir.

Q. Not by taking off the weight in the various gas-holders accordingly as the consumption ceases ?

A. It is not practical to regulate it in that way. Speaking of one gas-holder, which I know something about (I take the one at the South End, on the east side), it is strictly a gas-holder, not a regulator of pressure. It is where the gas is stored — unless it has been modified. It has but one pipe, an entering pipe, and no gas engineer would call that a regulator of pressure.

Q. The pressure, I take it, is dependent upon the proper regulation of the covers of those gas-holders by weights ?

A. If every operation of the gas-holder could be carried on momentarily, if those having the gas-holders in charge could know instantly the condition of things at different parts of the city, it might be possible to regulate the pressure by means of gasometers having inlet and outlet pipes. But those conditions are impossible ; therefore gas engineers resort to the " Governors " to regulate pressure.

Q. Do not those conditions regulate themselves after certain hours in the evening.

A. No, sir. The fact that it is not regulated is known, I suppose, to all ; and with, I have no doubt, the greatest care bestowed on that apparatus.

Q. (by the Chairman). If the pipes are too small in Boston for the supply of the consumers, do they not have to add to the weight upon the reservoir of gas at the works in order to drive it through the mains to keep up that supply ?

A. That is necessary. Where the pipes are too small, an increase of pressure is necessary to transmit a larger volume of gas in a given time through the same pipe.

Q. In your opinion, would it not be of advantage to the city of Boston if they had a law regulating the size of the pipes, and could control that matter, and say to the company, " You have got to increase the size of those pipes in order to keep up a supply to the citizens " ?

A. I don't know how far legislation could regulate a matter of that kind. I should have great doubts about regulating a matter of that kind by law.

Q. I have been told that in London, the pipes were changed from twelve inches diameter to thirty-six inches, by the power

and influence of the City Government, after the passage of the act of Parliament under which the matter was placed in their hands for regulation.

A. Yes, sir.

Q. (by Mr. Curtis). Do you know that the main pipes in Boston exceed in diameter the Philadelphia pipes?

A. No, sir, I do not know it.

Q. Have you had any opportunities to examine the size of the Boston pipes?

A. No, sir; I have stated distinctly that I have had no knowledge of the works of distribution there, other than the merest observation, for eight years past.

Q. Do you know that the price of gas in Philadelphia, is $3.15?

A. No, sir.

Q. Do you know that the city of Philadelphia operated its gas-works, in the year 1865, with a loss of over $350,000?

A. I do not.

Q. Do you know the reason why the English law requires that the pressure in London shall not be less than one inch?

A. I don't know why it is so stated. It is but a moderate pressure, I know. I don't remember why it is so stated.

Q. (by Mr. Stevens). I have understood you to say, that so far as regards the manufacture of gas by the Boston Gas Light Company at the present time, whatever may be the method they adopt, you can give no information at the present time?

A. I cannot.

Q. You have no knowledge of the Boston Gas Light Company's manufacture, as practised within the last eight years?

A. I have not.

Q. Have you been employed professionally by any Gas Light Company within eight years?

A. Not in connection with the works. I have been consulted repeatedly within that time on points of manufacture.

Q. You have no particular information about the operations of the Gas Company in Boston, within eight years?

A. No, sir, not within eight years.

Q. (by Mr. Hyde). Can you apply a regulator upon the main that shall act to distribute the pressure properly over the differ-

ent rooms in a building where the pipes vary as they ordinarily do when put over a building ?

A. No, sir. There will be a difference of pressure in the different rooms, depending on their height above the main pipes; but there may be a regular pressure. The " Governor " is intended to regulate the pressure, not to adjust it to every room.

Q. Will you describe that " Governor," which can be used ?

A. It is in principle and construction like the small gas-regulators that you see about the city in various places for private regulation. It is a small gas-holder, so arranged that as the pressure increases, the inlet pipe is diminished in area, and finally closes, if the pressure becomes excessive.

Q. When you were acting under the direction of the Gas Company, and experimenting to find what mixture or combination of coals furnished the gas desired — just what were you seeking to attain — the best gas possible, or the most economical ?

A. No, sir; a gas of about twenty-five candle illuminating power, and at the lowest possible cost.

Q. And you found that to be the dry Pictou and Albert ?

A. Yes, sir. With the materials then obtainable, using the various kinds of coal in this country, we found that mixture to be the most economical in producing gas of about that illuminating power, and a good quality of coke.

Q. I may have misunderstood you. In the manufacture of the gas of which you have spoken by the Boston Gas Light Company, were there but two kinds of coal used, the Albert and Pictou ?

A. In the manufacture of the gas formerly made by the Company, which was called Cannel gas, and was strictly Cannel gas, as Cannel gas is rated, two kinds only were used, — the Pictou and the Albert, from New Brunswick.

Q. Now, in the distribution of gas, as it is ordinarily distributed about our dwellings, through pipes put up by gas-fitters, is there any system by which the distribution is regulated, so that it is properly distributed throughout the building ?

A. It is, sir, so regulated, or was at that time.

Q. The Gas Co. have no control over that ?

A. Yes, sir; the Gas Co. did state the size of pipe to be used for the supply to be secured.

Q. (by Mr. Curtis). The number of burners ?

A. The number of burners.

Q. (by Mr. Jewell). Do you know any reason why gas cannot be manufactured as cheaply by the city of Philadelphia as it could be manufactured by the city of Boston?

A. The increased cost of mains in the city of Philadelphia, the less dense population consuming the gas, and the higher cost of fuel generally, all operate there.

Q. Suppose the production and consumption in Philadelphia to be two million feet a day, would not the increased consumption more than counterbalance any increase of cost that you have supposed?

A. I think not, sir. Philadelphia is a large city. It is twenty-eight miles long and eight miles wide.

Q. Should you be surprised to learn that the gas of Philadelphia cost, last year, to manufacture, $2.75 per thousand feet?

A. I should not be at all surprised to find that the cost stated; not at all, sir.

Q. Should you be surprised to find that the loss last year by the city of Philadelphia, they selling at $3.15 per thousand feet, was $350.000?

A. I should not, as I said before, be surprised at any thing I found in those reports.

Q. Do you know Mr. Manuel, the Chief Engineer of those works?

A. I know him simply by reputation.

Q. Do you know Mr. Charles Thompson Jones, President of the Board of Trustees of the Philadelphia Gas Works?

A. No, sir, I pay no heed to those reports whatever, as giving any reliable information.

Q. You do not believe in the truthfulness of the reports?

A. There is truthfulness about them. I don't mean to throw any discredit upon the reports: but they embrace other elements than we have been considering here, or that we should be called upon to consider here. I don't think that any estimate based upon the experience of a city differently situated from this would afford you the true data in regard to the cost of gas or its distribution here.

Q. Therefore, however high the character of the men who make this report, you would not give entire credence to the report itself?

A. I should give entire credence to the persons, and consider them as perfectly honest. That is not the feature I wish to pre-

sent; but that these reports do not cover the points that we wish to embrace in any statement of this kind. I think that no gas engineer goes to these reports for his facts; they cover other subjects, and go over other grounds.

Q. Do they cover grounds that ought not to be covered in determining whether a city can make gas and make it cheaper than a private corporation?

A. I don't think that is the point they have in view there.

Q. It appears from this report that there was actually a net loss, in the year 1865, of $350,433.82, the city selling the gas for $3.15 per thousand feet. The gas cost $2.79 the thousand feet, and there was a net loss on the public lighting of over $191,000, and on the gas sold to the public of more than $158,000.

A. I don't think any gas engineer would for a moment go to those reports, or consider them as the basis on which he would fix the cost of gas for any locality.

Q. Would not public officers strive to make a report of this sort as favorable as possible to the city where they reside?

A. That may be as favorable as possible to the city, and yet embrace elements which have no possible connection with the manufacture of gas in the city of Boston.

Q. What elements could be introduced?

A. There may be expenses that are not likely to be incurred here, and not likely to be incurred there another year.

Q. Such as what?

A. There may have been very large alterations.

Mr. Jewell put in "The Thirty-first Annual Report of the Trustees of the Philadelphia Gas Works, January, 1866."

TESTIMONY OF CHARLES C. PAGE.

Q. (by Mr. Stackpole). What is your name, and where do you live?

A. My name is Charles C. Page, and I reside at Deer Island.

Q. What is your occupation?

A. I act as engineer for the institution on the island—the House of Industry.

Q. Have you manufactured gas for the House of Industry?

A. We manufacture for the institution.

Q. How long have you manufactured?

A. Four years this next January, I think.

Q. How many retorts have you?

A. We have two retorts.

Q. How much do you use there?

A. At this time of the year, we consume from 55 to 60,000 feet a month.

Q. And in summer?

A. In summer, it runs down perhaps to 15 or 20,000.

Q. What coal do you use?

A. We use Pictou.

Q. At what cost is it supplied to you?

A. I think the last lot we had cost $9.00 a ton.

Q. What does your gas cost you?

A. With the coal that we have now, I think the actual cost of the gas, saying nothing about labor or wear and tear of materials, is about one dollar and from thirty-five to forty cents a thousand feet. Somewheres near there; within a few cents either way.

Q. Can you state the quality of the gas?

A. I have no way of knowing; no apparatus for testing it.

Q. As far as you can test it with your eye, how does it compare with other gas that you see?

A. If this is sixteen candle gas, as I heard it stated to-night, I should think ours might be fourteen, sure. We use nothing but clear Pictou.

Q. Are your works, such as they are, working well?

A. Yes, sir.

Q. (by the Chairman). How many retorts do you use?

A. We have two, but we don't use but one.

Q. Would the same amount of fuel answer for four?

A. Our retorts are set in two separate beds, so that in case one breaks down, we can have it repaired.

Q. If you had to make more gas, you could make it much more economically than you do now, couldn't you?

A. I think we could, for now we don't run the retort but about half the time, or a little more; and it takes just as much fire to keep the retort hot as it would to make gas, or very nearly as much.

Q. Do you know what amount of coke you get from a ton of coal?

A. I can't tell exactly. I have weighed it. I suppose it would vary some according to the quantity of water they put on it to

wet it off. I have weighed what coke came from 200 pounds of coal, and it was 150 pounds. That would depend some on how wet they got it in putting out the fire.

Q. Do you use the coke for your retorts?

A. Yes, sir.

Q. What percentage do you use for your retorts?

A. It requires the whole we make. If we needed gas enough for the institution to make it all the time, we should make more coke than we should require.

Q. Do you know the amount of coal tar you get from a ton of Pictou coal?

A. I should say we got about ten gallons per ton, as near as I can calculate. But I won't state that to be correct.

Q. Do you know what quantity a ton of Newcastle coal would produce?

A. No, sir, I don't.

Q. What kind of retorts do you use?

A. Iron.

Q. How many have you — only two?

A. Two.

Q. You say you could manufacture much more economically if you had to manufacture for a larger establishment, requiring more gas?

A. Why, it is very evident that we could manufacture cheaper, if we made it all the time. It costs just as much to fire the retort when we are not making gas, as it does when we are making it.

Q. Have you any other information that you can give the Committee in reference to the manufacture? If you have, you can state it.

A. Well, I don't know as I have any thing to volunteer. Any questions asked me, I will endeavor to answer to the best of my ability.

Cross-examined by Mr. Curtis.

Q. What sort of a machine do you measure your gas in?

A. We measure it with gas meters.

Q. Do you measure it all accurately as it comes out?

A. Yes, sir; we pass it all through the meters.

Q. Then this price of $1.35 or $1.40 a thousand feet includes nothing but the actual cost of the gas as it is delivered from the retort.

A. No, sir.

Q. It is the cost of the coal and the purification; no expense of distribution, or interest on the plant, or repairs.

A. No, sir. That is the net cost of the materials — the coal and lime.

Q. The coal, and the lime that is used to purify the gas?

A. Yes, sir.

Q. You use the same retorts that they do here in Boston.

A. Yes, sir; I believe we do, the same.

TESTIMONY OF JOHN CONWAY.

Q. (by Mr. Stackpole). Where do you live?

A. South Boston.

Q. And what is your occupation?

A. Engineer at the House of Correction.

Q. Do you make your own gas there?

A. Yes, sir.

Q. How much do you use in the course of a year?

A. I have not been there but a short time, and I don't know from actual knowledge how much.

Q. How long have you been there?

A. About two months.

Q. How much have you used in the two months?

A. We have no meter at our works.

Q. How much does your coal cost?

A. Our coal costs, they tell me in the office, about $13.00.

Q. Can you measure your gas?

A. There is no accurate way of measuring it, that I know of, without a meter.

Q. Then, how do you know how much your gas costs a thousand cubic feet?

A. Well, they have got a meter in the office, and one in the Lunatic Asylum, but the leakage of the pipes they can't tell any thing about. There is a gauge upon the gas-holder, but that is not accurate.

Adjourned to Monday evening, Dec. 3d, at 7½ o'clock.

MONDAY, Dec. 3d.

The Committee met at 7½ o'clock, and the examination of witnesses was resumed.

TESTIMONY OF CHARLES C. SALISBURY.

Q. (by Mr. Stackpole). Where do you live?

A. In New York city.

Q. Will you state what experience you have had in building gas works and in supplying gas?

A. I have done more at building than I have at supply. I have built some eight or ten gas works.

Q. Whereabouts?

A. Newport, R. I. (in connection with my brother), Milwaukie, West Troy, and Lansingburg.

Q. Have you visited other gas works in the principal cities?

A. Yes, sir.

Q. Will you state where?

A. London and Paris.

Q. And in this country?

A. Yes, sir, I have visited most of the gas works in this country.

Q. What experience have you had in superintending?

A. None. I never have superintended any gas works.

Q. Have you looked into the subject of building gas works and the supply of gas?

A. Yes, sir.

Q. Will you state what kinds of gas there are in England, and of what they are made?

A. The only two that are made in England are, the gas that is made from good Cannel coal, and that in ordinary use, made from the best coals, such as Newcastle. There are several qualities of coal that they use for making gas. There are only two companies in London that are using the gas made from Cannel coal.

Q. Will you state, very fully, if you please, what the difference between these two gases is?

A. The standard Cannel gas is about 24 candle light in London — the standard light of the sperm candle; the other is 16.

Q. What is the difference in the quality of the two?

A. The specific gravity is nearly double.

Q. In the Cannel gas?

A. Yes, sir.

Q. What other difference is there?

A. There is a difference in the illuminating powers. The Cannel gas is so rich that it can be burned with a two feet burner. The highest is three feet; two feet in the ordinary consumption.

Q. And as to the other gas?

A. The other, the average is about .450 specific gravity, and of that they make the standard 16 candles.

Q. What is the specific gravity of the Cannel gas?

A. It is between .800 and .900.

Q. Which is the purer gas of the two?

A. Well, the Cannel gas is the purest gas, containing the largest amount of carbon, which is the illuminating power of all gas.

Q. Which gas contains the most sulphur?

A. Well, it depends upon the coal from which it is made. The larger amount of sulphur is obtained from the lower grades of coal. Some of it is so bad, that they cannot make gas of it at all.

Q. Will you state what you know as to the quality of gas in New York?

A. We have made some photometer tests of the gas of the New York Company, which is not so high a grade of gas as that of the Metropolitan Company. The Metropolitan Company's gas is the highest grade of gas in New York; they use more foreign coal. The test that was made of the New York Company's gas was not made at the works, but away from them. The gas was passed through a five foot Scotch tip, at the rate of five cubic feet per hour, under a pressure of $\frac{8}{10}$ at the meter, and $\frac{6}{10}$ at the burner. Estimates were made every two minutes, with the following results: —

The first two minutes gave			$6\frac{4}{10}$	candles.
" second	"	"	$6\frac{3}{10}$	"
" third	"	"	$6\frac{2}{10}$	"
" fourth	"	"	$6\frac{1}{10}$	"
" fifth	"	"	6	"
" average was			$6\frac{2}{10}$.	"

Q. Where was the gas taken from?

A. It was tapped on Broadway, not at the Gas Works.

Q. Why not at the Gas Works?

A. Because they did not seem disposed to have a trial other-

wise than as the city used it. They wanted it taken where the city used it, not where any preparation might have been made.

Q. Was this test made by the photometer?

A. Yes, sir.

Q. Whose?

A. It was one made by the New York Petroleum Gas Company, and contains all the modern improvements. There is no better in the world than this. This was made under the auspices of Prof. Piggott, of Baltimore, a very eminent chemist. The standard candle was found to have consumed 2.13 grains of sperm to the minute. Reduced, therefore, to standard consumption, this gas was found to be equal to $6\frac{6}{10}$ candles. Another experiment was made, burning three feet per hour, with a pressure of $\frac{7}{10}$ at the meter, and $\frac{5}{10}$ at the burner. That average was $1\frac{95}{100}$.

Q. You arrived in Boston this morning, I believe?

A. Yes, sir.

Q. Have you noticed our gas cursorily?

A. Only a little this evening, very casually.

Q. How does it compare with New York gas?

A. I think it is up to the Metropolitan Company's gas. It is a higher standard than the New York city or the Manhattan. I should think it came up to the standard of the Metropolitan gas. That is the newest company. They use more of the foreign coal.

Q. How much higher should you say our gas was than the gas you have mentioned?

A. It is difficult to judge of gas by the eye. I should say this would run from 10 to 12 candles. It won't exceed 12, unless my eyesight fails me very much. I can't tell from the pressure; I don't know what pressure they are working.

Q. Is it as high as 17?

A. I should think not, sir.

Q. Could you say whether it was as high as 22?

A. I should say, with a great deal of confidence, so far as I am a judge, that it don't begin to run 22. If it did, you wouldn't burn it through five foot burners, or six foot, I can tell you that.

Q. Have you seen gas made from Pictou coal?

A. Not alone, I have not.

Q. Have you seen it used with a mixture of a small percentage of Albert or Cannel coal?

A. I don't know what they are using at the Manhattan and New York Company's works now. I know formerly they used at

the Manhattan one-half of both. Then their gas was a good deal finer than it is now.

Q. Can you make gas from Pictou coal, with a mixture say of ten per cent of Albert or Cannel coal, as good as you can make it from Cannel coal?

A. No, sir, I don't think it is possible.

Q. Will you state what the advantage is in burning gas at a greater or less density?

A. Why, the greater the density, the less the amount of consumption; you burn it through a less orifice. They are burning the Cannel gas in London through a two foot burner, and two feet are equal to any five feet in the other case.

Q. And how about wastage?

A. The percentage of loss in leakage is less.

Q. Can you say how much less?

A. I should say it was five per cent less. It is very easily to be got at. The lighter the gas the more leakage, under the same pressure.

Q. And I suppose gas of 12 candles is lighter than gas of 22?

A. Yes, sir.

Q. How would they compare in specific gravity?

A. I should say it would take between six and seven hundred specific gravity to give 22 candles. But that, again, depends upon the quality of coal that is used. You may get a coal with a great deal of hydrogen in it, and yet the specific gravity from the carbonic acid that is in it would give it weight.

Q. How would gas of 22 candles compare with gas of 12 candles in regard to leakage?

A. I should say the 22 candle gas would run about eight per cent leakage, and that running from ten to twelve candles would be 12 to 15 per cent.

Q. And how about the economy of consumption — the number of feet passing out?

A. The lighter the gas under the same pressure, the more passes.

Q. Will you explain fully, giving the philosophical reasons to the Committee?

A. Any substance that is light will pass out of the same orifice, in the same time, a great deal more than a heavier one. I don't care what you force it with, liquid or any thing else. Take a gas that won't afford any thing more than seven or eight candles, and

you will burn seven or eight feet of gas per hour through a three foot burner.

Q. How would that be with a richer gas?

A. You wouldn't burn it through a three foot burner. Gas that will run sixteen candles will burn through a six foot burner, and that is about as large as it should be burned through. In that case, you would probably get as good a minimum as you could get. You don't get as good combustion with a heavy gas, and can't burn it through a large burner.

Q. Which gas can be most easily regulated, Cannel gas, or the common coal gas?

A. I don't know that there is much difference. The Cannel gas is allowed to have twice the pressure, for it has double the density. The common allowance is twice the pressure, but it is not used under twice the pressure; the pressure is lessened to economize it.

Q. Which gas casts light the greater distance, gas of 22 or 12 candles?

A. Well, if a gas of twelve candles is burned through a two foot burner, and a gas of twenty-two candles is burned through a two foot burner, the twenty-two candle gas will show the largest light, decidedly.

Q. Is there any thing in the poorer gas which makes it cast light a greater distance than the richer gas?

A. I never saw it.

Q. Does Cannel gas, properly used, smoke?

A. No, sir, not if it is properly purified and managed beforehand. There is a good deal in the purification of gas.

Q. Will you explain which gas is the most likely to have the largest amount of hydrogen?

A. The poorest quality of gas.

Q. And why is that?

A. Because it is in the coal. The water that is in the coal, the material that is used, forms hydrogen, which unites with the sulphur, and sulphuretted hydrogen is the result.

Q. Does that hydrogen pass through the burner with the gas?

A. Certainly it does.

Q. And is of no advantage to the consumer?

A. It gives a large flame; but the more hydrogen, the less illuminating power.

Q. Have you made any estimate as to the cost of gas?

A. I have made a great many, but the cost of gas depends upon the price of coal and labor and materials.

Q. Have you made any estimate, taking what you found to be the average?

A. Yes, sir, I have made some estimates. I sent you some time ago a paper containing some estimates. If you have got that, it will give you some idea.

Q. Is this your estimate? (Paper exhibited.)

A. Yes, sir. They are estimates based upon facts obtained from the different works at the time they were made.

Q. Will you state what those estimates are?

A. The average cost of gas coals in the yards of several of our largest works, in twelve cities, for the past year, is $11.39 per ton of 2,240 lbs. One ton of good coal yields from 8 to 9,000 cubic feet of gas from the purifiers. Taking 8,500 cubic feet as the basis of production, and adding $4.70 as the cost of labor for the ton, and the time used for purification, and we have $16.00 as the cost of producing 8,500 cubic feet, or $1.88 per thousand feet.

Q. (by the Chairman). In what year was that estimate made?

A. 1865.

Q. (by Mr. Stackpole). If coal could be bought for seven or eight dollars a ton, that would make it much less?

A. That would depend upon the quality of the coal again. You may get a quality of coal that won't produce that quantity of gas. There may be a great deal of slate and impurities in it.

Q. Taking coal that would produce the same average number of feet of gas, it would make the gas much cheaper, wouldn't it?

A. Yes, sir, make it that much cheaper. The receipts from coke and tar are deducted, leaving the cost of the gas at $1.88. The Manhattan Gas Works sell about one-half of their coke, the other they use. They are introducing new retorts, which are generally coming into use. They originated in Belgium, and are made of clay. They are doubling the length of these, and decreasing the amount of coal required to keep up perfect heat. The only difficulty that surrounded them at first was, making them so that they should not contract and expand, in consequence of which, the loss was great, and they required a deal of care. By building them of double length, they are enabled to graduate the heat so perfectly, that while they are changing, there is not the great dif-

ference there was before. And there is an invention, which is claimed by other parties, but which I devised some three years ago, for cleaning out these clay retorts by the use of superheated steam. That cleans them thoroughly. It is perfect in its results, and therefore avoids the necessity of stopping to clean out the retorts. If they can do that, a clay retort will last a great while.

Q. Which are the best retorts, clay or iron?

A. Clay is the most economical; there is no doubt about that.

Q. Are you able to form any judgment as to the cost of gas in New York?

A. Well, I got some statistics. I don't know that our folks would care about my presenting to the world every thing. The Metropolitan Co. claim that their gas costs them $2.25. The Manhattan Gas Co. have not changed their price; they cannot; there is a law that prevents them. When they got an increase of their capital, they bound themselves to supply the city at $2.50 a thousand. They made application last year for authority to increase the price, and stated in that application that they were making no money, and could not go on and supply as they were. I don't think they are losing any money. I think they are making money now. I don't think their gas costs them over $1.88 any way. The increase in the price of labor has been large, but they have had very large profits heretofore; they have increased their capital stock twice to my certain knowledge — watered it, and it is pretty high now. I think it can't be bought less than $180 now.

Q. What is the par — $100?

A. Yes, sir; but that is after it has been made up to double its former capital. There are a good many other things to be taken into consideration about gas. In some cities, the locations and arrangements are such, that they have a good many repairs to make; others have less. Again: very much depends upon how a set of pipes are put into the ground originally. If they are botched, it causes a great deal of loss; a good deal of repairing takes place. I have laid pipes that have not been touched for five years; and again, I have seen pipes that had not been laid a year before they had to undergo a great deal of repair.

Q. Is compactness of advantage in supplying a city with gas?

A. Certainly it is. The less distance you have got to send your gas, the less liability to leakage.

Q. And the less number and extent of pipes?

A. Certainly. I think there are now about 600 miles of pipe lying in New York.

Q. In what position should gas works be placed in regard to level?

A. Lower, if they can be, than its consumption, decidedly.

Q. How, in your judgment, does the city of Boston stand with respect to facility for supplying gas?

A. The city of Boston, so far as I know, is very compact. You have not got many miles to go over. I have not studied it sufficiently to sit right down and answer a question of that kind, but looking at it with a bird's-eye view, as I have done before, it looks to me to be very compact.

Q. And suppose the gas works to be placed in one of the lowest portions of the city, is that an advantage or not?

A. Certainly. Gas ascends; it does not descend.

Q. What is your judgment in regard to placing gas works outside of a city?

A. Well, there are advantages to the city; in one respect — the effluvia arising from the manufacture is avoided. That is the great object in sending them away. Again, there is a result not favorable to the gas works — the further off the population is that is to be supplied, the greater the amount of pressure required to force the gas, and the greater the liability to leakage. If you send it five miles, you have got to have a main of not less than five feet, and then your distributing pipes must be more numerous in proportion. The city of London is making an effort to buy out the gas companies. Some of them have submitted their propositions, others have not. The object is to consolidate and have the city own the gas works, and put them out about twelve miles from the city, where the water communication for coal and every thing is the best, and then distribute the gas by gasometers in the city. The size and number of the gasometers would be governed by the consumption in a district. They would have to use artificial means, at that distance, to force the gas to the gasometers, and then the gasometers would supply their own force. That is the plan that is now, I believe, about being adopted there.

Q. How is it in Paris?

A. They have consolidated, but it is a company still; the city does not own it. The works are about eight or nine miles out.

Q. Is there any engineering objection to having gas works out of the city?

A. Only as I tell you, the further the distance the more power you must have to force the gas.

Q. But the power can be obtained?

A. Yes, sir; there are several means of forcing gas.

Q. Would any holders be necessary, if the works were located within a mile or two of the city?

A. No, sir.

Q. So that the gas could be distributed without holders?

A. Yes, sir.

Q. How would it be with regard to economy in the price of land, for erecting the works?

A. It might be less expensive to have them under one consolidation, because the amount of engineering would not be so large. There is this much about it; when you get a large distribution from the gasometer, you have got to be very careful in watching the pressure. There must be a man in attendance night and day. Notwithstanding the apparatus is very nice and perfect, it requires very delicate handling, because the pressure must be regulated to meet the wants of the community. There is a variation according to location, and much care would be required. Whereas, the other way, they would be under your control, if all together.

Q. Has there been any improvement of late years in disposing of the residuary products of gas?

A. In England, they are making colors from coal tar, which has increased the value of coal tar, I forget how much, but more than double. I don't know what they are doing here with it.

Q. How is it about coke?

A. The coke there is used not so much in families as for locomotives. All the locomotives are using coke; they do not use coal at all. There are large factories there where they make coke, merely to supply it to railroad companies, and do not use the gas at all. I have seen thousands of tons of it ready for distribution.

Q. Is the ammoniacal liquor used?

A. In some companies in England, they are using it. I don't know how it is here. Since I returned, I have not been among them to see what use is made of the ammoniacal liquors and tar.

Q. What is the product of a bushel of coal in coke?

A. You get a little more in bulk and less in weight.

Q. Does any of the lime used in purification remain to sell?

A. Yes, sir. They sell it for agricultural purposes.

Q. Do you remember about what percentage?

A. I think it is about a third of its cost.

Q. Which kind of gas is most liable to freeze in cold weather?

A. That which is the richest in carbon is the less liable to freeze. There is less ammoniacal liquor, less freezing qualities in it.

Q. Therefore the poorer kinds of gas are more liable to freeze?

A. Yes, sir.

Q. Which kind of gas, the Cannel gas or the Pictou gas, has in general the most sulphur?

A. The Pictou.

Q. And what is the effect of the sulphur?

A. It unites with the hydrogen, and forms sulphuretted hydrogen.

Q. What is the effect of that?

A. Effluvia and a bad smell. Decomposition takes place, and that causes the smell. Sulphur itself has no smell until it becomes changed. The burning of sulphur would not throw out any odor, nor would there be any injurious effect from it. I found a large number of people in England who would not use gas at all — the nobility, particularly; and their reason was, the liability of the sulphur to destroy their pictures and plate, sulphur having such a great affinity for every thing of that character that it deposits itself upon them. Lord Leigh told me that although he had over a thousand burners in his house, he would not use gas, because he considered his picture gallery more valuable than any thing he would gain by its use.

Q. Is Cannel gas liable to produce this effect?

A. It has less sulphur; but all of them have more or less sulphur. The richer the coal, the less coke, you will understand. That is a very important feature. You have got more gas, but less coke. The poorer your coal, the more coke, and the less good gas.

Q. What is the best pressure for burning gas at?

A. That depends, again, upon the quality of the gas; that is, for the economical benefits you are going to derive from it. If you are burning such gas as the New York Co. was making at the time this test was made, you would burn thirty per cent more gas through the same orifice than you would with a lower pressure, and I think you would get as much light with the lower pressure. Gas is like every thing else — it should be burned under the pressure most suitable to the quality of the gas.

Q. And when burned under other pressures is there more waste?

A. Yes, sir. The heavier the gas, the more pressure it will stand. The more solid any thing is, the greater pressure it will bear. Take gas at .800 or .900 specific gravity, it is entitled to twice the amount of pressure that light gas is, to get the same amount of consumption.

Q. And different kinds of burners are adapted to different kinds of gas?

A. Yes, sir; so far as the reduction of consumption is concerned.

Q. Then if gas is burned with the pressure at the meter best adapted to it, it will represent more candles than if it were not burned with this best pressure at the burner?

A. When you take a heavy gas, say that will run .900 specific gravity, it depends upon the size of the orifice. You put it in a two foot burner, and it will bear a great deal more pressure than in a three foot burner, because you will not get so perfect combustion with the three foot burner as with the two, for the reason that there is less gas from the two foot burner to come in contact with the oxygen and nitrogen of the atmosphere. In the two foot burner, by increasing the pressure, you increase the light of the flame. I have seen gas of .900 specific gravity burned through a two foot burner that gave as much light as a six foot burner, under the same pressure.

Q. Suppose gas to be burned under the pressure and with the burner best adapted to it, and amounting in that case to twelve candles, would that represent the amount of candles that could be got in every instance?

A. Well, I don't know. There is a little nice point there, which I would rather have the photometer test, before I answered that question right to the point, because I have never looked at it in that light. I will illustrate that in this way. With a two foot burner, using the common gas, about 10 or 12 candles, you won't see a great deal of light — very little. If you take a four foot burner, you will get a good deal more than twice the light. The light is all obtained from the solid particles of carbon that the gas contains. That is the light, after all that is said and done. It is all in a nut-shell. In some instances, phosphorus adds to the brilliancy, and take any light burning in pure oxygen, it increases its light very largely.

Q. What number of candles, in your judgment, is the proper standard?

A. Sixteen is a good standard. Gas standing sixteen is a good gas.

Q. Should gas be allowed to go below this?

A. I think it does go below it. Whether it is "allowed" or not, or how it is "allowed," I don't know. For economy to the consumer, the gas should be that, because, as I said before, the lighter the gas, the more he pays.

Q. The richer the gas is, the more economical?

A. Certainly. If you can burn two feet an hour and get the same amount of light that you could from five feet, you have certainly made that difference.

Q. Then gas of 12 candles would be less economical than gas of 20?

A. Yes, sir; a great deal.

Q. And for a number of reasons?

A. The principal one is, as I told you, that the lighter the gas is, with the same amount of pressure, the less the illuminating power.

Q. (by the Chairman). You stated, a little while ago, that in 1865, gas cost, in the city of New York $1.88. If you took gold at par, it would cost but $1.32, would it?

A. There would be the difference in exchange and the difference in duties, too. The duty increases in the same ratio with the exchange, because the duties are all in gold.

Q. Then the cost would be $1.32 instead of $1.88, taking gold at par?

A. Yes, sir. But they take good care, these large companies, of course, to buy their coal at the lowest price. Then I think there is some minimum arrangement by which the large companies are importing their coal at a certain price. And yet I don't know but it is kept at gold, notwithstanding; but yet I think there was a regulation made a year ago by which the standard price for coal should not exceed so much. Labor is coming down some, but gas companies do not always find it prudent to change and get cheaper labor, because after a man gets experience, his labor is worth more.

Q. I suppose the gas companies generally buy their coal cheaper than other people?

A. Oh, yes. The Manhattan Co. have a contract with the owners of a mine. I was with one of them the other day, — I

forget his name, — and he showed me an order for a very large quantity — some thousands of tons. Gas companies sometimes have difficulties to undergo and losses that are not always put in the bills. For instance, there have been two cases where fires have occurred, one in Brooklyn, and one in the Manhattan works, by which the Brooklyn Co. lost some $45,000, and the Manhattan Co. 70 or $80,000, by spontaneous combustion in bodies of coal. It requires a great deal of watching and care to see that these things do not occur. I don't know that they are occurring here, but these are two instances where they occurred in New York and Brooklyn, and came to a reality; they have occurred a great many times where the fire has been extinguished without any great damage.

Q. Do you know whether they buy their coal by the ton or chaldron?

A. By the 2,240 pounds, I think. And there is always more or less thrown in. I think it will overrun, as a general thing; I don't think it will fall short.

Q. (by Mr. Stackpole). Is there any valid reason why Cannel gas or rich gas should not constitute the whole supply of a city for domestic purposes?

A. The question is as to the quantity of material that you can get and the cost of it. The quantity of coal you would get and consume might increase the cost of it; and if the cost of coal is increased, the price of the gas would be increased in the same ratio.

Q. How would it be in regard to economy to the consumers?

A. I have conversed with a number of the proprietors of our principal hotels, and I found that the lights in their rooms would not consume more than a foot an hour, and a good light, too; therefore the Cannel gas would be the most economical to the consumer. It is not so profitable to the gas companies, for they cannot afford to make gas out of Cannel coal, for the reason that the consumption is not large enough. If I make six millions of feet, and only two millions are necessary for practical purposes, my profit is on the two millions and not on the six. The greater percentage consumed would be greatly in favor of the gas companies making gas of less specific gravity. The heavier gas is the more economical to the consumer, but it is not to the manufacturer.

Cross-examined by Mr. Curtis.

Q. Do you feel satisfied in your mind that you have stated correctly the standard of gas in London at 16 candles?

A. Mr. Letheby, who is the inspector of the city of London gas, gave me that as the standard.

Q. Aside from Mr. Letheby, do you know what the standard is, as established by Act of Parliament?

A. No, sir, I can't say that I do, by Act of Parliament. I know there is a great deal of pride in the city of London in keeping up the standard to Mr. Letheby's requirements.

Q. Then the result of what you say in reference to that standard is, that it is usage, and not the legal standard?

A. It is the usage of the city of London, so far as I am conversant with the different gas men, and I have been present at their tests a number of times, and I have seen the tests of Mr. Farraday at the House of Parliament. Mr. Farraday has charge of the Parliament buildings.

Q. What gas is used there?

A. The Cannel.

Q. Is that made at the Horseferry Street works there?

A. I forget the name; it is not far distant from there.

Q. Do you know whether they experience any ill effects from the vicinity of the gas works to the Parliament buildings?

A. No, sir, I don't know as I have ever heard any complaint at all. There has been more complaint lately in London, as I have seen by the newspapers, than I have known before. They have been very careful in carrying away the effluvia by tall chimneys, and consume a large amount in that way.

Q. Do you know what the Parliamentary standard for Cannel gas is?

A. No, I do not. I think I am right in saying that the standard is 22. I don't know what the act of Parliament is. I did not even make the inquiry.

Q. When we talk about a standard, I suppose the Committee understand that we refer to a standard such as they propose, or as the Counsel proposes, to have established here by a law of Massachusetts. Now, I want to get at what is the legal standard, so far as you know established by act of Parliament.

A. I don't know whether Parliament or who established it. All

I know is, that Mr. Letheby is appointed to settle that question, and that his certificates at 16 are taken.

Q. You don't know whether by the Act of Parliament, Dr. Letheby has power to alter the standard that has been established by Act of Parliament?

A. I don't know whether he is employed by the city of London or by the Government. I rather think that he is employed by the Government, from the many different things that come under his care.

Q. You know, I suppose, that within a few years, they have been districting the city of London among the various gas companies?

A. Yes, sir. All places there are under what are called trusteeships. The trustees have the government of the local authorities.

Q. They found that putting more than one set of pipes in the streets of the city of London was productive of great difficulty, didn't they?

A. They object to it on many grounds. Two or three new companies wanted to commence operations, and the opposition to their starting was brought before these trusteeships, and they gave it as their opinion that it was injurious to the city to open the streets for these pipes.

Q. Before they re-districted the city of London there were several sets of pipes running in the same streets, were there not?

A. Yes, and they came in contact with each other. They had a great deal of difficulty, and then they districted them, the same as, in New York, they have divided the city between the Manhattan and New York Gas Companies, so as to avoid collisions.

Q. Before that, there were several sets of pipes traversing the same districts?

A. Yes, sir, so I understood. I went there in 1859 and was there until 1863.

Q. And I suppose you know of this, from your acquaintance with gas experts?

A. Yes, sir, I got that information.

Q. One of those difficulties arose from leakage?

A. Yes, sir, constant repairing. One was fixing and another fixing on the same street and the consequence was, the street was open all the time. And then there wasn't the best feeling as to whether they stopped each other's leaks or not. There was

a continual row, giving the trustees a great deal of trouble, and the city was districted off.

Q. Did this leakage have a bad effect upon the water mains?

A. It had a bad effect upon every thing. It was not only the street, but, as I suppose you are well aware, it will kill trees, and down in Kensington, a whole row of trees was pointed out to me, that the gas had destroyed. It got into the Park, in one or two instances, and destroyed some of their fine trees.

Q. I suppose it is a well known fact that upon mixture with certain proportions of atmospheric air, gas becomes explosive, and in that state is dangerous?

A. Yes, sir.

Q. And also contains poisonous gases to inhale?

A. Yes, sir.

Q. Therefore it is beneficial that gas should smell a little badly?

A. If there was no smell, there would be no notification of danger.

Q. Therefore it is not advantageous that it should be perfectly pure?

A. No, sir, because if it was perfectly free from all odor, you might have an explosion. The odor is like an alarm-bell, it tells you in an instant that there is something wrong about your house. I look upon it as a great advantage to have some indication of that nature. Cannel gas smells, but not to the same extreme that other gas does, because there is not the same amount of decomposition taking place. Sulphuretted hydrogen is what smells, and that comes from decomposition. You take an egg, and it is free enough from smell until decomposition takes place.

Q. Then you would not carry purification to an extreme?

A. No, sir, because then there is danger. There is one advantage in building beyond the city limits, in getting rid of the smell. If I was going to put up gas works, I should build a large, tall chimney, carry it up to an immense height, and consume the effluvia entirely. It can be done, but it is rather an expensive job.

Q. Two hundred feet high enough?

A. No; I wouldn't build it less than three hundred. I would carry it up where there was a temperature that would be always safe. I am busy now in a very important matter, in which I have probably succeeded; that is, desulphurizing iron ore and consuming the sulphur, instead of having it pass to the iron.

Q. Whether gas works are in a city or not depends upon the march of population, does it not?

A. Yes, sir; I should say largely on that.

Q. And where gas works have been removed from a city, it has generally been done from economical motives?

A. Yes, sir; because the distribution has been increased greater than the distance they remove. Take New York city. Within my recollection Canal Street was quite high up. My brother-in-law, Mr. Roome, is manager of the Manhattan works. He began there as clerk, collecting bills, studied thoroughly, and made himself master as he went along, and there he is to-day. He is probably as good an authority as there is in the world. The probability is, that those Manhattan works are as well regulated as any in the world. With the exception of the Paris works, which have been consolidated, the works in Europe are small works, and with that exception, there are no works so large as the Manhattan works. The motives to remove would be the increase of population and the increase of distribution.

Q. And the increased value of the land where they have hitherto been?

A. That might be one object, and distribution is another. They have got to increase their distribution, and they might as well go up, and take up their heavy mains, and distribute through them.

Q. Have you not got the Parisian works a little too far from the Hôtel de Ville? You say eight or nine miles, are they more than four?

A. I have got the distance exactly, but not here.

Q. They are within what you may call the bounds of Paris?

A. Paris is like London, — the environs are larger than the city is. The works are within the city limits; they are, however, away from the heart of the city.

Q. So that now the works at La Villette are not outside of Paris?

A. No: they are in Paris proper now.

Q. (by Mr. Jewell). You think that if the gas of the Metropolitan Company of New York is about $6\frac{2}{10}$ candle power, the gas you see here is 10 to 12?

A. Yes, sir; judging by the eye.

Q. You have not made any examination of our gas?

A. No, sir.

Q. Have you made any examination recently of the New York gas?

A. No, sir; not since last summer.

Q. (by Mr. Curtis). Are you acquainted with the Philadelphia works?

A. I am acquainted with Mr. Myers, who is the second superintendent of the works. I have the statistics of those works; I have not heard exactly what the cost of their gas is now.

Q. They have no motive, through dividends, or profits or otherwise, to shareholders, to misrepresent the cost of the gas, I suppose?

A. No, sir.

Q. Do you find in their Report for 1865 what the cost of the gas was?

A. Yes, sir; embracing repairs and every thing.

Q. Ought not those to be included?

A. I was giving the cost of the gas.

Q. (by Mr. Jewell). You fix the cost of producing the gas at $1.88, without including the cost of the repairs, interest on the plant, and all the other items?

A. I didn't take them in at all. I was merely giving the cost of producing the gas in the meter.

Q. Independent of distribution and the other elements?

A. Yes, sir. It is generally understood that a gas company's dividend should not be charged in the cost of making it.

Q. The common estimate among gas manufacturers is, that the cost of coal is about half the cost of gas to the company, is it not?

A. The cost of the coal, after selling the coke.

Q. Is not the cost of the coal about half the cost of the gas, as it goes to the consumer, including all proper expenditures to be charged to repairs and other items?

A. Well, some will overrun it.

Q. It will be more than half in some cases?

A. Yes.

Q. (by Mr. Stackpole). The cost of the coal will be more than half?

A. It will depend upon what they sell their products for you know. There is where the thing comes again.

Q. (by Mr. Curtis). We are talking about the estimate arrived at by general consent among manufacturers. What ratio does the cost of the coal bear to the cost of the gas as coming through the tips?

A. Well, I suppose, taking the average, it would be half and half.

Q. Do you know what the peculiar qualities of the Albert coal are?

A. No, I do not, sir.

Q. Then you are not familiar with its use in New York?

A. No, sir. It must be a very rich Cannel coal, if it is used as a mixture.

Q. (by Mr. Jewell). Do the New York companies, to your knowledge, use Cannel coal to any extent?

A. No, I don't think they do. I don't know what the proportions of their imported coal are.

Q. (by Mr. Curtis). If you were told, and had reason to believe, that one ton of this Albert coal would produce as much illuminating power as three tons of Incehall Cannel, then you would alter your opinion in reference to the possibility of making rich gas with that coal mixed with Pictou?

A. Yes, sir. If it was as rich as that, it would be like mixing oil with it. Of course that would produce very little coke, and produce large quantities of oil, if distilled. I saw samples of coal in London, brought from Brazil, that was very rich. I don't know what amount of gas it would make, but it was almost solid oil.

Q. If that is the case with the Albert coal, should you see any difficulty in making rich gas with a mixture of that and Pictou?

A. No, sir. If I was going to give an answer to that, I would make my own tests, and see what it would bear. I won't say, out and out, what it would or wouldn't.

Q. I understood you to say that with that small mixture of Cannel coal, ten per cent, and Pictou, you could not make a rich gas?

A. That is what I said; but when you take coal such as you represent, solidified oil, it is different. 24,000 cubic feet is all you can get, I think, out of a ton of oil. The highest I have ever seen obtained was 21,000 cubic feet to the ton; and that was done by a process that is not generally known, from petroleum oil.

Q. Would you be willing to take time to examine the Boston Gas Works, their process of purification, the illuminating power of their gas, and every thing connected with the manufacture?

A. I should have to come here again to do it. I should be very happy to do any thing I could. I will give you my time the moment I have it to spare. I have no interest particularly in this matter, and no desire but to ascertain the truth. I have had a great deal to do with gas, but I should like to see some one who has had more than I have.

Q. (by the Chairman). Assuming that the Albert coal produces a 35 candle gas, and the Pictou a 12 candle gas, what proportion of Albert coal would you, as manager of a Gas Company, mix with Pictou coal, in order to furnish the greatest profit to the Gas Company?

A. You must assume another thing — the cost of that coal, that solidified oil. That is a very important feature in the calculation. I suppose it is very similar to that I saw brought from Brazil. I could take it and put it to a light and burn it. If it is like that, then it is as rich as shale, and shale gives about 60 candles. The cost of that material, and the cost of the Pictou coal would have to govern me, in answering that question, very largely. If I was for making money, I should want to know what proportion of that which cost the most could be used with that which cost the least.

Q. Assuming that Cannel coal is a 30 candle coal, and Pictou to be 12, what proportion of Cannel coal would you mix with the Pictou?

A. Well, I should say 25 to 30 per cent, so as to use it in large burners.

Q. I suppose the difference between Albert and Cannel coal is about five per cent?

A. It is as rich as oil if it produces 35 or 36 candles, because oil stands 35 to 36.

Q. (by Mr. Stackpole). Has there not been a great deal of complaint in London and Paris, lately, of the Gas Works, on sanitary grounds?

A. I have not been there lately, but I see that there is a disposition, lately, to remove the works. As I said before, there was a disposition on the part of the trustees of the different

corporations in London to remove them; what will be the result, I don't know. It is like a good many other experiments that are got up there and elsewhere.

Q. (by the Chairman). If you were to manufacture gas from petroleum oil, at from 20 to 25 cents a gallon, how much cheaper gas could you make than from any coal?

A. I know that gas from petroleum and shale and rosin oil, manufactured by a proper process, can be burned through a two foot burner. I have burned it through a three foot burner, without any smoke. All you want is perfect combustion. I have spent a good deal of time over these oils, and I have found results that probably other people have not found. There are a great many difficulties in making gas from oil, that I have got rid of in a measure, I think; but still it may not always be considered safe to say that I have until I do. I don't like to say that I can do a thing until I feel beyond all cavil and question that it is done. The difficulty in the way of using petroleum oil in retorts has been that the oil clogged up the retorts with carbon almost instantly, and they would be of no account but a little while at a time. By using superheated steam, and converting it as soon as possible into hydrogen and oxygen gases, I have increased the capacity fifty per cent, of the illuminating powers, taken as a whole, but the increase is not quite so large in proportion when it comes into consumption. The only question arising from that is, whether the condensation of those gases can be changed back again into ammoniacal liquors. That question it will require time to settle; but I made, not a great while ago, some experiments for the Government, with the New York gas and gas made from oil; and the gas made from oil gave a light from a two foot burner fully up to that given from a six foot burner by the New York gas. Its condensing ratio, taking it at zero, was two-thirds less than the New York gas. The light was almost extinguished. It had got to be largely of a blue and yellow shade, and hardly any of it.

Q. (by Mr. Stackpole). Of the coal gas?

A. Yes, sir. The oil gas itself is so rich in carbon that it won't stand condensation.

Q. Supposing this invention of yours to be perfected, what difference will it make in the cost of gas?

A. I don't think it will be very profitable for the gas companies.

Q. How about consumers?

A. If they consume less, that will be an advantage for them. If a man is going to make gas for his house, and consume less, it will cost him less.

Q. I mean, comparing the thousand feet?

A. I say a two foot burner will give as much light with the oil gas, as a six foot burner gives with the New York gas. That is settled beyond all question or cavil. I suppose it will cost three dollars a thousand to make gas from oil.

Q. (by Mr. Jewell). Will you state whether, in your judgment, there is any gas that you observe that is of better quality than this used here?

A. We have got none in New York. This is about the standard, I should judge, of the Metropolitan Co's Gas.

Q. Is there any better in the country, in your judgment?

A. No; I think, the farther west you go, the poorer the gas, as far as my observation goes. Philadelphia has good gas. I think their gas is richer than this. It looks so to me, by looking at it with my eyes; I wouldn't like to say it is or is not.

Q. (by Mr. Stackpole). You have been asked about the smell. Does rich gas have the peculiar odor of other gas?

A. As I say, there is less sulphur in it. It has enough. Oils have none. Petroleum oils have no sulphur in them.

Q. There is no practical danger of gas being so purified as not to smell?

A. No, sir, it will smell.

Q. If you raise it to a high quality, it will still smell?

A. Yes, sir.

Q. (by the Chairman). Does it not increase the cost of gas to the consumer to burn it constantly under a pressure of two or two and a half inches?

A. That would depend upon the richness of the gas. If gas is very light, it will burn a great deal more than it would if it were heavier. I don't think that, with a gas of sixteen candles, a pressure of 2½ inches is too much. A great many people turn it off if they find it so, reducing the consumption at the burner.

Q. (by Mr. Jewell). Two or two and a half inches' pressure would not be too great a pressure under which to burn 16, 18, or 20 candle gas?

A. No, sir; gas at 16 or 20 would burn under that. Cannel gas, where it has got that specific gravity, is entitled to twice the pressure the other has.

Q. (by Mr. Curtis). When you speak of 2½ inches' pressure, you mean at the main works?

A. Yes, sir.

Q. That would bring it down to about half an inch where the flame is produced?

A. Not so low as that, I think — about $\frac{7}{10}$ perhaps. I suppose that when the consumption is largest in great cities, the pressure must be the greatest to meet it; when it decreases, the pressure is diminished. At ten o'clock, I suppose they take off some of the pressure, and at eleven o'clock take it off again.

Q. So that two and a half inches of pressure does not represent correctly the amount of pressure under which we are burning gas in this room?

A. No, sir, only at the point where it is made.

Q. (by the Chairman). Assuming that gas is burned in Boston under a pressure of two or two and a half inches and in New York under a pressure of seven or eight tenths of an inch, and that the quality of the gas of certain works that you have named is as good as you think it is, is not the consumer here, burning under a pressure of two or two and a half inches, a large loser in comparison with the New-Yorker, burning under an eight-tenths pressure?

A. The general supposition is, that when you speak of two or two and a half pressure, it is at the manufactory.

Q. (by Mr. Stackpole). There would be a loss to the consumer if the gas was now burning in this room with a pressure of 2½ inches?

A. You would burn more gas.

Q. It would not be economical?

A. I should consider it was burning uneconomically.

Q. (by Mr. Jewell). There is no trouble about reducing the pressure by turning the cock?

A. No, sir; you reduce the quantity consumed. If you find the gas is escaping rapidly, you turn the cock, and the consequence is you reduce the quantity of gas by lessening the orifice. There is the same pressure, but a less amount consumed.

Q. (by Mr. Stackpole). Therefore, by turning the cock at the burner, you do not affect the pressure?

A. No, sir. All you can do is to have a regulator in the building, if you want to affect the pressure in a building of this kind. There have been a great many attempts made to regulate it, but I have never seen any that amounted to much.

Q. It must be regulated at the factory?

A. Yes, sir, that is the general understanding, and it is understood that it is so regulated.

Q. Then if the water gauge should indicate that we were burning gas under a pressure of two, two and a half, or three inches, you could not decrease the pressure by turning the cock?

A. You do not decrease it; you decrease the orifice which the gas is passing through.

Q. (by the Chairman). If you increase the weight upon a clock, it will run faster.

A. If you take a pulley, and increase the amount of weight upon it, the probability is that it will travel down faster than before.

Q. If gas enters the meter under a pressure of two and a half inches, is it not forced over that meter with much greater rapidity than it would be if it was consumed under a pressure of half an inch?

A. Certainly it goes through faster.

Q. It will reach the burner with a greater pressure, and consequently with increased consumption?

A. It will reach the burner quicker. The increased consumption depends on the quality of the gas. If the gas has a certain specific gravity, with a certain pressure, it will go faster through the orifice.

Q. And a good deal will escape, having deleterious properties, that will affect silver, pictures, and the ornaments of a room?

A. There is always an amount of sulphur from coal that will escape and deposit itself on plate, and the more inferior the gas, the more of it.

Q. If the gas was coming into your house under a 2½ inch pressure, would you not consume the gas more economically if you should turn off the faucet that is between the meter and the street, to an angle of 45 degrees?

A. You would make a difference in your house consumption. There is no doubt about that.

Q. If it went to my burners under a pressure of half an inch, through the influence of a regulator, and the pressure was 2½ out in the street, I should save from 35 to 50 per cent in the consumption of my gas, shouldn't I?

A. I have seen a good many regulators, but I have never seen any that regulated it to that extent. It is a very delicate thing to get a regulator that will regulate it. There have been a great many attempts to increase the flame of gas, and by increasing the flame gain a larger amount of light; but the flame has been increased, in my estimation, with a diminished amount of light, in proportion. There is a man round the country who is passing gas through naphtha. It is a mechanical arrangement, wholly so, and a change of temperature must send that back where it belongs. I don't think there is any thing to be made out of that. I own a patent for that, which I think is probably as good as any other there is in the world. I saw some experiments made in cold weather, and it cost more than it came to. The light is increased, no doubt, but you get an increased temperature, because you get a large amount of carbon with it.

Q. (by Mr. Curtis). Is not the stop-cock about as good a regulator as there is?

A. I believe it is about as good as you will find. I thought I had a very good one, but on testing it for a time, it turned out not to be so.

Q. (by Mr. Stackpole). Is the stop-cock as good a regulator of the pressure as a regulator at the works?

A. No, sir. I think that is the best place to regulate it. But there is a difficulty; because at one moment the consumption is very large, and at another it is less. It requires a very nice arrangement at the works.

Q. (by the Chairman). Under the London inspection, how often is the gas inspected?

A. Once a month the report is made.

Q. How often in the day does the inspector inspect the gas?

A. I think he keeps a record from six o'clock in the morning until twelve, and then from six in the morning until twelve at night.

Q. He inspects in the day?

A. Yes, sir, so as to take the average of pressure and every thing else throughout.

Q. If it is necessary for the city to have an inspector of gas in order to give the public the right knowledge of the quality of the gas, the pressure, &c., it is necessary for him to make these inspections every day?

A. He then gets at it very accurately, if he makes them at night and through the day, and takes the average difference of consumption.

Q. If there is but one inspector in the State of Massachusetts, and he is called upon to inspect the gas in Boston, Worcester, Lowell, and Springfield, how can one man do it in the twenty-four hours?

A. I don't think it is in the power of any man, having the whole matter in his control, to do any part of the State justice. The State of New York has got very much the same system, and I don't think it amounts to a row of pins as far as that goes. There it is a sort of sinecure.

Q. It affords very little protection to the consumer?

A. I never saw his reports yet.

Q. Do you know whether the Philadelphia gas manufactory is managed by politicians and city officials, so that it is made subject to their control and will, for junketing, or any such arrangement as that?

A. Now you are ahead of me.

Q. (by Mr. Curtis). Do you know what the New York inspector inspects?

A. I don't know that he inspects any thing. I think his duty is to inspect every thing, but I think he is always about home; I don't think he ever goes abroad largely.

Q. (by Mr. Stevens). Any thing coming from Mr. Myers, of Philadelphia, of whom you have spoken, so far as regards the cost of gas, would be accepted as correct?

A. Yes, sir; he is second engineer of the works now. He is

the working man there. He is a German by birth, and seems to be a very honest, straightforward man.

Q. (by the Chairman). But if the gas cost twice what it should, he would have to make a return of what the actual cost was?

A. I think he would. I have met him probably half a dozen times. I met him on the photometer tests, and I have seen a good deal smarter men than he is there.

Q. (by Mr. Stevens). Do you remember his first name?

A. I have got it, but not here.

Q. (by the Chairman). Have you any knowledge of the wet and dry meters as instruments for the measurement of gas?

A. They are using the dry meter now as preferable. Some prefer it, and some do not. There are a good many that like it, and a good many that don't like it. I am well acquainted with the maker of it in New York. He is a Scotchman, and has been a great many years engaged in the business. He says it is preferable to the wet meter. It is preferable in this respect, that it does not require the care to be taken of it in cold weather that the wet meter does. At this season of the year, a great deal of care is needed with the wet meter not to have water there or any thing else that will freeze up. The dry meter avoids that.

Q. Have you ever heard that the dry meter is condemned in Scotland as an instrument for measuring gas?

A. I believe I have heard they condemned it in England; but, on the other hand, it is preferred by some. I have seen it as cold in London as I have ever seen it in this country. The gas froze so that you couldn't get a light all over the city.

Q. Did you ever hear of their being condemned because hoar frost formed in them?

A. I heard that was the case. It is the ammoniacal liquor. I have seen as much as a quart of ammoniacal liquor taken out of a meter in Brooklyn.

Q. (by Mr. Curtis). That would stop its operation?

A. Well, it becomes very thick, but you get the gas through it.

Q. (by Mr. Jewell). The consumer gets the gas, and the company don't get paid for it?

A. I think that is it.

Q. (by the Chairman). Are you aware that the Scotch gas men pronounce the dry meter a failure, and make the declaration that the freezing of the meter is a loss to the consumer of 35 per cent?

A. The gas is not all burned. In this case at Brooklyn, where the man was away from the house, the meter registered a certain amount as consumed, but he did not consume it, and the meter showed it was there, in the ammoniacal liquor.

Q. That was a dry meter?

A. That was a dry meter.

Q. Have you ever heard it stated, that if the owner of a house goes into the country in the month of June, and comes back in October, the coal tar upon the leather valve that works in the dry meter has become hardened, and the meter measures 30 to 40 per cent against the consumer as well as against the company sometimes?

A. I never saw coal tar get as far as that. If the gas is properly purified, I don't see how it could get there.

Q. Have you ever heard it stated in England that the coal tar entirely consumes this material, which looks like leather, I don't know whether it is or not, so that it is not servicable at all, and cannot be relied upon?

A. No, I have not; there may have been cases. There have been investigations going on there that have been more scrutinizing than ever before in the world, and there may have been things found that I have never heard of.

Q. (by Mr. Jewell). In the long-run, don't all meters, dry and wet, err, on the average, in favor of the consumer?

A. Well, I don't know. I have seen a good many tests made at meter manufactories, both here and abroad, and they are made so exact that they won't vary, — well, they are not intended to vary any thing at all.

Q. On the whole, is there any thing that is measured, either by fluid or dry measure, that on the average, in your judgment, gets so accurately measured as gas?

A. If the meter is made as it should be, it measures it accurately, as nearly as it is possible to make mechanism do it. It comes as near to a watch as possible in its regularity, but yet, watches get out of repair, and so do meters, and they should be inspected, to see that they are kept in order.

Q. (by the Chairman). If a meter is expected to measure within five per cent of the correct measurement, is it as correct as a yard-stick or a gallon measure?

A. No, sir, it is not.

Q. (by Mr. Stackpole). Is the leather apt to get hard?

A. I have not seen that tested in dry meters. Whether the effect of the ammoniacal liquor will destroy the leather in a certain time or not is a thing I have not seen demonstrated. I have had a regulator, where we have used leather for the valves injured by the ammoniacal liquor, that has eaten up the leather.

Q. (by the Chairman). Have you ever seen any glycerine meters in New York?

A. No, I have not. They are using them largely in Cincinnati. I should think that where glycerine is used, it would have a tendency to injure the leather valves. It may not, but it strikes me that it will eat almost any thing I have ever seen.

Q. The object is to use it in a cold climate? There is little or no evaporation?

A. Yes, sir.

Q. (by Mr. Curtis). Glycerine is a fatty acid that will ultimately destroy almost any thing?

A. Yes, sir. This naphtha will eat up any metallic substance that I have ever seen.

Q. (by the Chairman). If you had a meter in your house that you thought was out of order and measuring against you, would you prefer that that meter should be inspected at your house or taken down and carried to the Gas Company's establishment before it was inspected?

A. That would depend upon my feeling of trust towards the Gas Company. If I had any doubts about them, I would have it inspected at my house; but if I had not, and trusted them, I would have it inspected at the establishment.

Q. Suppose the meter was a dry meter and had been frozen up by hoar frost, and measured against you, and that by carrying it to the gas works, the frost melted before it was inspected, and the inspection demonstrated it to be right, should not that meter be inspected in your house?

A. I should say it should. I don't see any objection to inspecting a meter in a house, either. It is generally easily done by sending a proper man.

Q. The State Inspector in the city of New York confers no benefit upon the citizens that you know of?

A. I have never heard any one say that he was of any benefit to him. In fact, I don't believe there is one out of a hundred inhabitants in New York who knows that there is a gas inspector.

Q. (by Mr. Stackpole). In your judgment, should not every meter be inspected before it is allowed to be used?

A. That is what they say when they make them — that every meter is thoroughly inspected. Now, if you doubt them, you should have it inspected when you put it into your house.

Adjourned to Tuesday evening, at 7½ o'clock.

TUESDAY, Dec. 4.

The Committee met agreeably to adjournment, and the examination of witnesses was resumed.

TESTIMONY OF CHARLES ROBBINS.

Q. (by Mr. Stackpole). Where do you live, and what office do you hold?

A. I live in South Boston, and am Master of the House of Correction.

Q. How long have you held that office?

A. Thirty-three years and more.

Q. Do you make your own gas there at present?

A. Yes, sir.

Q. What coal do you manufacture it of?

A. Pictou.

Q. How much does that cost you?

A. It cost last year, delivered at the institution, $9.60.

Q. 2,240 lbs?

A. 2,240, I presume, sir.

Q. Have you made any calculation as to what your gas costs you?

A. We always make monthly statements to the Board of what the gas costs.

Q. Can you give the cost during the last month?

A. The whole number of tons of coal used the last month was 19 and about a half of Pictou. That, at the present price, $9.60 a ton, amounts to $186.85. Six casks of lime, at $2.00 a cask, $12.00. Making in all $198.85. We have used at the prison, the hospital, and the house, 49,000 feet. At the office, the gate, receiving room, bake house, officers' quarters, and two yard lights, 10,900 feet. Brush shop, 3,000 feet. Lunatic Hospital, 79,050 feet. In the female shop, where we use some gas, we have no meters, and we reckon the consumption by the burners. Female shop, ten burners, twenty days, 2½ hours, each day (estimated at eight feet per hour for each) 4,000 ft. Total amount of gas consumed, 145,950 feet. Cost per thousand cubic feet, 1.36\frac{2}{10}$.

Q. Have you deducted from this the coke?

A. No, sir. The coke we burn under the retorts, most of it. There is some little of the sweepings that we use in our boilers. If there is any waste or ashes, it is used in other ways.

Q. Do you sell or make any use of the tar you get?

A. We sell the tar.

Q. Have you deducted that from this estimate of cost?

A. No, I have not.

Q. Do you know how much it was you got?

A. Since September to the 6th of November, we have obtained five barrels of coal tar from 25 tons of coal used.

Q. How much have you sold that at?

A. I think that was a dollar and a half or two dollars a barrel, I don't know which. I have not deducted the tar we made from the last month.

Q. What use do you make of the refuse lime?

A. Some of that we use upon the ground, the rest we throw away.

Q. What sort of gas do you get?

A. We think we get very fair gas; as good gas as I see burnt almost anywhere.

Cross-examined by Mr. Curtis.

Q. Is the quality of the gas made from Pictou coal altogether satisfactory to you?

A. It is, sir.

Q. How many hands did you employ in making it?

A. We employ at the present time four during the 24 hours;

that is, two during the day and two during the night. We call them four, because there is one that we call a man and one invalid; one smart man to tend the retorts and one merely to turn the crank. He is not able to do any thing else.

Q. Are they paid any wages?

A. They are not, sir.

Q. They are convicts?

A. Yes, sir.

Q. Nothing enters into this cost but coal and lime?

A. That is all. That is all the calculation that is made.

Q. What day's wages would you have to pay these men if you had to hire them to attend to that?

A. That I cannot answer, sir.

Q. Wouldn't you have to pay them at least two dollars a day?

A. I should think not; not for that class of help.

Q. About the same as they pay in Boston?

A. We could get better men than those for that price. One of them might perhaps be considered an able-bodied man, the other is not.

Q. Do you know what the cost of the gas works themselves was?

A. I do not. The gas works were put up about 1858 or 1859, I think.

Q. Have any repairs been made upon them?

A. They have all been built over new since they were originally put up, mostly.

Q. Have you ever tried to make an estimate of the actual cost of the gas, with all the repairs and expenses counted in?

A. No, sir.

Q. Have you tested it with the photometer, to ascertain what illuminating power it has?

A. No, sir. It was attempted some four or five years ago. I think Mr. Giles came over there and examined it, and tested it, — tested the number of candles, &c., but what that was now, I can't recollect. It appears to me it was in the vicinity of some twenty candles, if I remember rightly. I know at that time we had some trouble with our gas works, and had from the original gas works first put up, because they were not half made, or not properly made, and I called upon Mr. Giles a number of times for information and for assistance, and I always got it.

Q. Down at the Boston Gas Works?

A. Yes, sir, and he assisted me somewhat in some of the works, putting in a new purifier, &c.

Q. What sort of retorts do you use over there?

A. We use Mr. Giles's retorts.

Q. Iron retorts?

A. Yes, sir.

Q. What meters do you use to measure the gas?

A. We have two wet meters and one dry meter at the institution, and at the Lunatic Hospital we have one dry meter. These are all the meters we use; and our meters I don't think are perfect; I have reported them a number of times.

Q. Then you have not strict confidence in the meters?

A. I have not strict confidence in the meters at all.

Q. (by the Chairman). You deem them very inaccurate instruments of measurement, don't you?

A. I do, sir, myself.

Q. The men you employ could manufacture three times the amount of gas they do if you could consume it, couldn't they?

A. The same number of men could probably manufacture double the quantity of gas that we make. There is no doubt about that, I think.

Q. (by Mr. Stackpole). Could you make more gas with the same number of retorts?

A. We don't use but one at the present time, and we don't at all times force that retort to its full height.

Q. You have two retorts?

A. We have two, but then we don't use but one but very seldom.

Q. (by the Chairman). You could use a bench of six or seven clay retorts with the same amount of fire?

A. Yes, sir, use any number.

Q. (by Mr. Putnam). Do you use wet or dry purifiers, or both?

A. We use the wet, sir. I know but little about the manufacture of gas. I never saw but very little of it until I began to manufacture at the institution. I have visited some few works, but very few.

Mr. Stackpole stated that, in the absence of some witnesses he had expected to examine this evening, he would like to ask Mr. Greenough (Treasurer of the Boston Gas Light Co.) a few questions, if there was no objection. The counsel for the Company stated that they expected to call Mr. Greenough, and that they would prefer to have his testimony taken as a whole rather than fragmentarily. If, however, they found it unnecessary to call him, he would be present, and the counsel for the Committee should have an opportunity to examine him, with the same power that he had now. Mr. Stackpole said he was content with this arrangement, if it was perfectly well understood.

The CHAIRMAN. Perhaps I may as well say here, that we do not consider that we are sitting to investigate the affairs of the Boston Gas Light Co. They may show that their management is perfect, and all their operations conducted in the best possible manner. That is not the question. The question is, whether, on sanitary grounds, and with a view to the benefit of property in Boston in the neighborhood where the gas works are located, they should be removed from the city; whether it is not best for the interests of the city, and eminently proper, that the city should supply the citizens with gas at its minimum cost, so that the people should have the right to regulate the quality of the gas, or any thing else that belongs thereto. Then another question here before us is one of great importance, and that is, the inspection of gas in such a manner as shall be satisfactory to the citizens, and also to consider the expediency of having an inspector for the city, who shall impart the information that he, as inspector, would be able to impart, in regard to the most economical mode of consuming gas, the best mode of adapting our fixtures to economy in the consumption, the best burners to be used, and every thing of that kind. These are questions that the State Inspector is under no obligation to answer, and if asked them, he would not answer; but these are questions, as I conceive, that we are to consider, primarily, in this investigation. The Gas Co. have come in here and asked that they may be heard. The Committee are very desirous of getting information in regard to the mode of manufacturing gas, in regard to the material that is used in the manufacture, the different kinds of coal, &c.; but as regards the whole matter, if the Company should prove to the perfect satisfaction of the Committee that every thing is well done in their

departments, then comes back to us the question, and that is primary, whether the city shall put up works outside the city and supply the citizens at cost. That is the way the Committee, I believe, understand their duty in the investigation of this question.

TESTIMONY OF JOSEPH W. TUTTLE.

Q. Where do you reside, sir?

A. 38 Sheafe Street.

Q. How long have you resided there?

A. About ten years.

Q. What is your occupation?

A. Commission merchant.

Q. How near do you live to the works of the Boston Gas Co.?

A. Well, my house is the third from Snowhill St., and Snowhill St., on one side, passes the gas works. Perhaps I am five or six rods from the works.

Q. Have you observed what effects the location of the Boston Gas Light Co.'s works in that situation have produced?

A. Well, sir, I have seen the effect in the reduction of the value of property.

Q. Will you state whether there is any other effect produced by the location of the gas works where they are?

A. There is a very fine sifted dirt. The chimney is very high; we don't smell very much of the gas; I suppose it goes over us where I live, I am so close to it; but we have a very fine sifted black dirt, that will penetrate where wind will go, I assure you. It is fine, and a great deal of it.

Q. Does this dirt get into your houses?

A. Oh, yes, sir, terribly.

Q. How does it affect your furniture?

A. I don't know that it harms it any other ways than it keeps the women at work all the time. I can't say that there is any stain; I should think not.

Q. What annoyance is it personally?

A. Well, it is quite an annoyance personally, because, when you go home to dinner, supper or breakfast, you have that sifted on to you all the time.

Q. Have you heard much complaint about it in the neighborhood?

A. No more than we are always complaining; that is about all.

Q. You own real estate there?

A. I own my house.

Q. What is the effect of the gas works on real estate, in your judgment?

A. Well, I will tell you. Perhaps I can illustrate it in this way. I gave $5,000 for my house, and I have offered it, when real estate has been going up, for $4,500.

Q. And no buyers?

A. I have not sold it. It is a good place to live; good land; good high ground; except the nuisance of the gas house, as I think.

Q. How about the effect of the other real estate in the neighborhood?

A. I see no reason why it should not affect it the same as mine. I am not posted only about my own real estate. The auctioneers say, when they sell property there,—they tell a pretty large story, probably,—that it would double the price of real estate if the gas works were not there. I think that may not be true.

Q. Has the Gas Light Co. bought any real estate there?

A. I think they have, a large quantity.

Q. How much?

A. I can't tell. I know one day there was an auction of 25 buildings that were sold to be torn down. Those were not near all that they have taken down; I judge 40 or 50. I don't know only by judgment. Some are moved, and some are torn down; mostly torn down.

Q. In your judgment, how was the price at which they were enabled to buy these estates affected by their being there?

A. I don't know about that.

Q. Can you offer any opinion about it?

A. Of course they bought them very reasonable. They were old buildings. They would naturally buy them low, of course.

Q. Would not the price at which they were enabled to buy be affected by the fact that real estate had depreciated there because the gas works are there?

A. Of course it would.

Q. Do you see any thing to prevent their buying more real estate there which has been depreciated by their own action?

A. No, sir; I should think they might buy real estate at lower prices than they could if it were not for the gas works. It is

very evident that the gas works reduce the price of real estate. I think every man who lives there will say that.

Q. And in that way they are able to buy at a cheap rate what is injured by their own works?

A. I think so.

Q. Are there any other facts that you know that you think would be of importance to the Committee?

A. I wish to name in regard to the meters (if it would do any good), that they are liable to make mistakes. I don't understand the meters; I don't know but they are always the same; but they made a mistake at my store one day of some four thousand feet. Well, they rectified it, of course. We said, right off, it was a mistake; we knew it couldn't be so: an examination was made, and the mistake was rectified. I think the meters should be made in such a way that any man can know how much gas he burns, without any great deal of study. I don't know but they can now, but I don't understand them. It seems to me every man ought to be able to know whether his meter registers right or not. I don't accuse the Company of any mistake.

Cross-examined by Mr. Curtis.

Q. That was not necessarily a mistake of the meter, it was a mistake of the man.

A. It was a mistake of the man.

Q. What should you say real estate would be worth, if the gas works were not there?

A. I think it would be worth $6,000, what I gave $5,000 for.

Q. How much a foot?

A. It is only a house, you know. The land is almost covered with the building.

Q. What I want to get at is, what you think it would be worth a foot.

A. I can't tell, because I haven't bought any thing of that kind.

Q. Do you know the dimensions of your lot?

A. Yes, sir; it is 17 feet wide, and runs back 49 feet, I think. It is in a block. The building is not the whole of it, because there is a yard behind it. 17 by 32 the house may be; something like that. About 800 feet I should think there was.

Q. You bought your estate with the knowledge that the gas works were there?

A. Of course I did, but I was not aware of their effects, because I was an out-of-town man.

Q. Has there not been quite an accession of Irish population in that part of the city?

A. Well, yes. I don't know. Yes, they have come into our own street, because folks wouldn't live there; they moved.

Q. They have come into Snowhill Street and Snowhill Court?

A. Yes, sir.

Q. Don't you think that depreciates property?

A. Yes, sir, it does. One reason they come there is, because they can buy building lots cheap. They don't care so much about the location. They work in the gas house and are dirty, and would just as lief be dirty as not, perhaps, and just as lief live in the dirt.

Q. But it don't improve the value of the neighboring land to have them there?

A. Perhaps not, but they accumulate there. They are a nuisance, I say.

Q. What direction is your house from the gas works?

A. It is about south.

Q. Westerly from your house, there are a good many foundries and blacksmith's shops?

A. Oh, yes, a blacksmith's shop is close by; nearly the first thing that I come to from my house.

Q. Are there not marble works on Charlestown St. and Traverse St.?

A. That is some ways from me.

Q. Don't the prevailing westerly winds blow their smoke over your premises?

A. We never see any thing of the white dirt; we see the black dirt altogether.

Q. They burn black coal, don't they?

A. I think likely.

Q. Don't they make much more thick smoke than the Gas Co. does?

A. That is some ways from where I live.

Q. (by Mr. Jewell). The Gas Co.'s works are no more prejudi-

cial to you than any very large foundry? An iron foundry of the same dimensions would be about as injurious as this?

A. I think not. I think this fine dust is the worst of it.

Q. The consumption of great quantities of coal in your immediate vicinity would cause the same or similar effects?

A. I don't know about that dust. I think this dust is the worst part of the story.

Q. (by the Chairman). There is no difficulty in recognizing this dust that comes from the gas works in distinction from any soot that would come from any marble factory where they have a steam engine?

A. Oh, yes, you can distinguish it; you can tell this dust. You go by the windows, and you can see that every one of them has some of that dust, and you must know where it comes from. It is all evident enough.

Q. Is that dust so light that you inhale it?

A. Some of the time it is. It has been very bad of late. They have moved a block of old buildings, that used to catch some of the dirt. They have moved them away, and there is an open space coming right into Sheafe Street, and we have abundance of it now.

Q. You deem these gas works detrimental to the health of the people who live in that neighborhood?

A. I cannot answer that. We have got a very healthy spot of ground. Perhaps with that circumstance, even if it was injurious to health, we might be as well off as other folks that live on made land. I am not sure. It is a healthy place, and would be, if it were not for the gas works, a very healthy place.

Q. Supposing the present value of the ground to be $1.75 a foot, what would be its value per foot if the gas works were not there, in comparison with other parts of the city?

A. I think it would advance fifty per cent immediately if the gas works were removed.

Q. (by Mr. Davies). Are you ever troubled at all with the smell of gas?

A. Very little; very little indeed. I have had it beat down in a sultry sort of day, when they were doing considerable, so that you would smell it: but very little. The chimney is very high,

and I think they would be as likely to smell it twenty, thirty, or forty rods off as where I live.

Q. (by Mr. Curtis). If the Gas Co. built a high wall or structure between them and you, wouldn't that benefit your place?

A. If they built it high enough.

Q. If they built it as high as the buildings that were removed?

A. I think it would remedy what they have done by taking out the old buildings.

Q. How high should you like to have it?

A. I should like to have it as high, I was going to say, as heaven. That would suit me.

Mr. JEWELL. Mr. Chairman, I suppose, from what has been said, that Mr. Stackpole is nearly through with his testimony. Of course, I am not aware how much more he has got, but I suppose he is nearly through. The Boston Gas Light Co. would be very glad to have all the members of the Committee, at any time which they shall select, — not at a time selected by us, because then it might be said that we had prepared our works, or done something to put them in a different condition from what they ordinarily are, — go down to the Company's works, with the counsel, and any experts the Committee desire to take with them, and see every part of the works, see every process, and make all the inquiries and inspections they desire; see our process of purification, the quality of our gas, and the character of our materials. Mr. Curtis and myself would be very glad to go down at the same time, but we do not wish to fix the time. If the Committee will agree upon any time, we will go down with them at fifteen minutes' notice, and Mr. Greenough will go down. The Committee will then be sure that every thing is in its ordinary course. It is hardly necessary to say, that there can be no change in the works, from one day to another, except a change in the coal. That has to be given out on the morning of each day. If the Committee go to-day at 12 o'clock, they will see the works operating as they operated yesterday, and as they will operate to-morrow.

THE CHAIRMAN. If the Company is manufacturing on the most scientific principles that are adopted anywhere, in Europe or in this country, and the Committee could be shown that, positively

and clearly, it would be the means of aiding them, perhaps, in arriving at the conclusions they are trying to arrive at in regard to the cost of manufacturing gas. If they are in any respect behind the times, and do not use the modern improvements, then, through those works, the Committee would not arrive at those facts which they desire to ascertain, in regard to what a ton of coal produces of gas, what quantity of coke, and what quantity of coal tar, and the price that is obtained for coke and coal tar. All these items of information we want in order to come to our conclusions.

Mr. JEWELL. I assure you, Mr. Chairman, if you go down to the works, you shall see the quantity of coal we use every day of the year — the quantity of Pictou, of Lingan, and Cannel; the amount of labor employed, and how much coke and coal tar is produced in the course of a year. Every thing that those works exhibit shall be at your service. The materials are there, I have no doubt, to show all the facts, and if you have any doubt about the operation of the works, call on any gas engineer you desire to go with you and give you information.

Adjourned to Friday evening, at 7 o'clock.

FRIDAY, Dec. 7.

The Committee met, agreeably to adjournment.

Mr. Stackpole said, that, before proceeding to call any more witnesses, he wished to call the attention of the Committee to the Report of the Trustees of the Philadelphia Gas Works, by which it would appear that the loss last year, instead of being $360,000, as previously stated, was $158,000. The Report for the year 1864 showed that there was a gain that year of $371,000; and the Report for 1865 mentioned a number of things, in addition to the rise in the price of labor, which made the loss that year much greater than it would otherwise have been. He thought the whole thing should be taken together.

TESTIMONY OF JABEZ F. HEWES.

Q. Where do you live?

A. 140 Prince Street.

Q. What is your occupation?

A. I am a baker.

Q. Is your establishment at that place?

A. Yes, sir.

Q. How near is that to the Boston gas works?

A. It is right opposite.

Q. Do you own real estate there?

A. Yes, sir; I own my place.

Q. Your bakehouse and your house?

A. Yes, sir.

Q. Are you acquainted with the value of real estate in the neighborhood?

A. I know what I paid for mine.

Q. In your judgment, what is the effect of the gas works upon the value of real estate in your neighborhood?

A. Well, I paid $1.95 a foot for mine fifteen years ago, I think it was; and if I was to judge what my estate is worth now by what Mr. Prescott, who does the business for the Gas Company, paid for the estates opposite, $1.25 a foot, probably mine wouldn't fetch any more, if it was to be sold.

Q. Will you state what the effect of the gas works is in your neighborhood?

A. Well, if Mr. Greenough will come and live in my house three years, I will give him my real estate.

Q. State your reasons for that. What damage do they do there?

A. Well, it is all dirt and filth. I tried to be respectable once in my life, and had some paintings in my house; but I have had to cover them all up. It is all dirt, all through there.

Q. What is this dirt caused by?

A. The dirt that comes into my place is caused by the welting out of the coal. It is not the chimney.

Q. What form does it come in?

A. It is all through the house just like snow under a door.

Q. Is this constant?

A. Yes, sir. It is worse in a foggy time, when the wind is north-east. It sweeps right in. We can't keep any thing clean. We have to take our crockery all out of the closet and clean it, after such a time as that.

Q. Do you experience any difficulty in washing your clothes?

A. We don't very often wash when the wind is north-east, or on a stormy day. We almost always wash the clothes on a fair day,

and it don't trouble us then. Then the wind is not north-east, so as to sweep it in.

Q. Do your neighbors experience the same trouble?

A. Sufficient for myself is the evil I have to endure. I have had my place painted several times; I sha'n't have it painted again. I had it painted a year ago last May, and paid $135, and in six weeks it didn't look any better than it did before. The back part of the house has never been painted since old Billy Gray owned it, and sold it to the man I bought of, and the front part didn't look any better than the back part six weeks after I had it painted.

Q. Do you know this dirt comes from the gas house?

A. Yes, sir.

Q. What kind of dirt?

A. Well, it is dirt. There is, all the time, dirt; but the time when it troubles us most is when the wind is north-east, and it drives right in.

Q. Have you heard any other complaints from anybody?

A. Well, you see, in that particular vicinity I am the only American that lives there. My business has kept me there. If I could have got money enough, I should have gone away. I have no family except my wife, and we think perhaps we had better stay there. The other people are principally laboring men; most of them work in the gas house, and of course they wouldn't complain of it. All of them work there, in fact, except when you get farther up the street. There, some of them own their houses. There is nobody that lives there down so low as I am that would be likely to find fault.

Q. Most of the people are employees of the gas works?

A. I should say so. I don't know where the men work.

Q. Has the Gas Company lately bought any property there?

A. Yes, sir.

Q. What have they bought?

A. They have bought almost all up to Snowhill Street. They have made a clean sweep pretty much. There are two old estates they have not got.

Q. Do you know what price they gave for it?

A. No, sir. They never let anybody know when they want any thing. They have a very intelligent man who manages their affairs. He knows how to do their work carefully and prudently, and when the thing comes out it is all done.

Q. Have you any thing else to state in regard to the effect of the gas works there?

A. The lawyers will call me a swift witness, because I am so much personally concerned. It is killing me. It would have knocked my business all to pieces if I hadn't had some business that was not dependent upon what they have driven away from me.

Q. In what way?

A. The first day they started round the corner of Prince Street, they struck ten dollars' worth of trade out of my shop; and they have just struck ten dollars more out.

Q. How is that?

A. By driving off the inhabitants.

Q. Has there been any great change in the character of the inhabitants since the gas works came there?

A. I don't suppose there has been any more change than goes on regularly in different sections of the city at times.

Q. What has been the change?

A. The change has been, there were some very respectable people who lived and owned houses there, and they have left. Many of them have moved out of town, &c., the same as they do from other places. On the back side of the gas works, up on Snowhill Street, and Hull Street, I am not so well posted. I don't know what the change has been up there, only in my own neighborhood.

Q. (by the Chairman). What in your judgment would be the increased value of real estate down there where you live, provided the gas works were entirely removed?

A. Well, that is rather a difficult question to answer. My property would be worth double to-day what it is. This very piece on Prince Street would be worth double to-day what it is, I think. That is my opinion.

Q. In your opinion, would the property round the State House sink to about the value it is with you if the gas works were placed there?

A. Yes, sir. There is no place in Boston that you could put the gas works but what it would be worse than Prince Street is to-day. Property would be worth less, in my opinion. That is only my opinion.

Q. Do you think the city has any right to permit gas works

within its limits, when they have such an effect upon the value of property?

A. I do not. I started once to get an injunction on them, when they undertook to go up Prince Street; but Mr. Charles P. Curtis told me, more than thirty years ago, when he was counsel for me, "Don't you never go to law; it is worse than a fit of sickness;" and when I looked into the matter, to show cause why they ought not to go up there and depreciate the value of real estate, I took Mr. Curtis's advice and didn't go into law. I found that the responsibility fell on me. The old inhabitants had kind of given it up. They had fought it in old times, and considered that they had fought it enough. Mr. Harris said he had fought them out as long as he could. When I found that I had got to go to law with a rich corporation, who rather seek law than otherwise, because they have their counsel paid all the time, I thought I had better not touch it. My remonstrance against their extending their works on Prince Street is on file in the city government.

Q. Did Mr. Curtis give you an opinion on the law of that question?

A. Mr. Curtis was not my counsel at that time. It was about another matter that he gave that advice. It was twelve years ago that I wanted to put on an injunction. I thought they had no business to come there and destroy the value of my property, as I knew they would, and as they have. But I found the laboring oar was on me, and I had got to get the testimony and put it in; and I well knew these rich corporations understand the law pretty well, and they had their counsel; this gentleman (Mr. Jewell) was counsel for them then.

Mr. JEWELL. Not at that time.

WITNESS. Yes you was. Then I petitioned to have the city stop their building up there; but Mr. Holbrook (he was one of the Aldermen then) came down to see me, and said the petition would be put on file. It is on file, probably, and will be kept there.

Cross-examined by Mr. Jewell.

Q. Do you think the removal of the gas works now would restore the same class of population that you say used to be there 20 or 30 years ago?

A. No, I suppose not.

Q. You don't suppose that taking them away would remove the Irish population away from there?

A. No, sir.

Q. Then you don't think your house would be worth double if the gas works merely were taken away from there?

A. Well, pretty much the whole of the city of Boston is occupied for something. There is a perfect blank. I call it my park. When they want to tax me for my place, I tell them of the nice park I have in front of my house.

Q. You don't think your house would double in value merely from taking away the Gas Company's Works?

A. Yes, I do. There is no place in Boston where property is worth so little as at the North End. The Gas Company has been steadily decreasing the value of it, whereas in other sections of the city it has been rising.

Q. (by Mr. Curtis). Did you buy before the Gas Company went there or after?

A. I bought my place before the Gas Company came up on Prince Street.

Q. Not before the Gas Company was established there?

A. Oh, no. I am not an old man enough for that.

Q. (by Mr. Stackpole). If the Gas Company keep on making their aggressions, what will be the effect of them?

A. They will have the whole of the North End to Hanover Street, if they go on as they have since I have been there.

Q. What effect will that have on property?

A. It makes a perfect blank, except what they use themselves.

Q. (by Mr. Stevens). Is there any greater deterioration there than there would be if there was a large iron foundry there, similar to those at East Boston?

A. I shouldn't think iron works would be so bad as that. I don't know. I am not a critic. The gentleman asked me to come and testify after you had had these scientific gentlemen, and I didn't want to, for I am not scientific. I know only as far as I am concerned. I beg to be understood. I believe these gas works are managed as well as they can be, I don't believe there is any thing that could be done to make them better that they wouldn't do.

Q. (by the Chairman). The influx of the Irish population is owing to the deterioration of the property isn't it?

A. The tendency was that way when I moved there, although there were a great many respectable people living there. But there were a great many laborers employed by the Gas Company, and they live as near as they can. They get houses, they let out rooms, and they pay for what they get, and the tendency is to locate as near the gas works as they can.

TESTIMONY OF SIMEON P. TAYLOR.

Q. (by Mr. Stackpole). Where do you live?

A. On Sheafe Street.

Q. What is your occupation?

A. Coal and wood.

Q. How near do you live to the Boston Gas works?

A. I should think 200 or 300 feet perhaps from some part of their premises. Considerable further from the works — from the chimneys.

Q. Do you own real estate there?

A. No, I don't.

Q. In your judgment, what is the effect of the gas works there?

A. I think it is decidedly deleterious to real estate in the vicinity of the gas works.

Q. Can you give the Committee any statistics in regard to the depreciation of the value of real estate, or any information comparing the past and present value of real estate?

A. Well, the depreciation has not been so great as it might have been otherwise. As real estate in other parts of the city has been increasing for several years, the real estate at the North End has about held its own, as a general thing. But round in the vicinity of the gas works, I should say that real estate had been gradually depreciating.

Q. How much, sir?

A. Well, there is one piece of real estate that is in about the middle of Sheafe St., that was sold a short time since, and it didn't bring within 30 per cent of what it was worth eight or ten years ago.

Q. Was that depreciation caused by the gas works, in your judgment?

A. Well, yes, directly and indirectly. The effect has been to

crowd out respectable people from the vicinity of the gas house, and a different class has taken their place. The tendency has been to drive the most respectable part of the citizens from the North End.

Q. So that those who live near by are those employed in the gas house?

A. Yes; and a different class of people from those who formerly lived there.

Q. In your judgment, if the gas works were to be removed, would it tend to increase the value of real estate?

A. I think it would, decidedly.

Q. Have the gas works recently purchased any real estate in that vicinity?

A. Yes, sir, they have recently purchased a large tract.

Q. How does that affect the value of real estate?

A. Well, the more they occupy there, the more it must depreciate. The farther they extend, the more it must affect the value of real estate, evidently.

Q. Is there any other deleterious effect from the presence of the gas works there, from dirt, or any thing else?

A. Well, the smoke and fine dust that we all experience, who live in the vicinity of the gas works.

Q. Will you tell the Committee how that affects you?

A. Well, it is something of the nature of lampblack — very fine; but it is sure to find its way through the windows when the wind is in a certain direction.

Q. It injures your carpets and so on, does it?

A. Yes, and particularly washing days. I hear of it from my wife more than any other way in that respect, — that they have to wash their clothes over a second time.

Q. Are there many complaints in the neighborhood, that you know of?

A. I don't know that there is any thing particular. It is an old subject. We all understand at the North End that the gas house is a nuisance there. That is well understood, and to the point, I think.

Q. Have you any other information, on the subject you can give the Committee?

A. I don't think of any thing in particular.

Q. (by Mr. Hyde). Are you one of the assessors this year?

A. I am, this year.

Q. I suppose this fact is true, that property at the North End, whether in the vicinity of the gas works or not, has not increased very much the past ten or fifteen years on Salem Street, and through there?

A. That is very evident.

Q. Now, how does the price of real estate where the direct influence of the gas works is felt, compare with the price of real estate in other parts of North End where the occupancy of the real estate has remained about the same as it was ten or fifteen years ago?

A. There has been such a scarcity of houses for the last few years, that there are hardly any houses there to let; every thing is taken up. What it would have been if the gas house had not been there, I cannot tell. The probability is that the North End would have been growing instead of deteriorating.

Q. Let me ask you this question, then; How far does the dust and offensive peculiarities of the gas works extend beyond the works?

A. That is more than I can tell.

Q. How far do you live from where the dust arises?

A. From the nearest chimney — I never measured it — it is merely guess work — it may be 300 feet.

Q. From people living how far from the gas works have you heard complaints in relation to the dust and about the gas works being a nuisance?

A. That is a hard question to answer. I have not been round to post myself up in that respect. I know it is generally understood that the gas works are any thing but comfortable to those who live in the vicinity; but how far from the gas works they may have that effect, I won't say. Of course there are others who live further from the gas works, who probably could answer that question better.

Q. I suppose, as a matter of fact, nobody would have the gas works located next to his dwelling-house for the sake of the benefit that would accrue. What I want to get at is, how far back the injurious effects of the works are felt?

A. Since this question has been agitated I have conversed with a few who live on Salem Street. That is more than twice as far from the works as I live, and I think they don't experience this

fine dust particularly that I have referred to. I think they have not experienced any inconvenience from it.

Q. How does the value of real estate on Salem Street and Charter Street compare with the value of real estate (I mean the same class of property) on Sheafe Street, and the streets immediately adjacent to the gas works?

A. I think that, coming from the gas works, real estate would be growing higher all the time. I know up at the corner of Hull and Snowhill Streets there was a piece of property that the party found a good deal of fault about the valuation of. He told me he would sell it for $1.25 a foot, and I tried to sell it to the Gas Company, — I thought I might speculate a little upon it, — but they wouldn't give me even that much; whereas, it would be worth two dollars a foot if it was not for the gas works.

Q. (by the Chairman). There are about 200 acres, we will say, of the State lands on the Back Bay. Now, place gas works of the magnitude of those at the North End in the neighborhood of Commonwealth Avenue, would the State be able to sell any more of those lands, and would not all the estates that are now there be depreciated very largely in value?

A. There is no doubt about that.

Q. (by Mr. Stevens). Would not the effect be the same if a large iron foundry, with tall chimneys, were erected there?

A. Yes. I presume it would.

Q. (by Mr. Jewell). Would not glass works like those over to East Cambridge be equally objectionable as gas works?

A. I don't think they would. There, one difficulty is we smell the gas, which is offensive.

Q. There would be the same dust, wouldn't there?

A. I presume if they used the same quantity of coal, they would make dust. I think it would be just in proportion to the quantity of coal they might use, compared with the gas works.

Q. (by Mr. Hyde). Charter Street, North Bennett Street, and Salem Street, in the character of the occupancy of the dwelling-houses was originally about the same as on Sheafe Street, and Prince Street, that is, 15 or 20 years ago?

A. Prince Street was in its prime before I lived at the North End.

Q. I mean, before the gas works began to have much effect there?

A. I think Prince Street has been deteriorating more than almost any other street at the North End.

Q. How long have you lived there?

A. About fifteen years.

Q. Go back fifteen years. At that time, what was the character of the occupancy on Sheafe Street, Hull Street, Salem Street, and North Bennett Street?

A. I should think there was not much difference. Sheafe Street and the head of Salem Street were considered the best parts of North End.

Q. How does the value of real estate on those streets now compare with its value on Sheafe Street and Hull Street, down near the gas works, where their immediate influence has been felt? If you appraised the property for taxation on North Bennett Street, Salem Street, and Charter Street, how would you appraise it, compared with property of the same character on Hull Street, Sheafe Street, and Snowhill Street, down in the immediate vicinity of the gas works?

A. I can't tell precisely. There would be a difference in the style of houses — a very great difference. As for the land, that we appraise separate. Until we got up near the gas house, there wouldn't be much difference, equally well situated.

Q. Supposing you took a lot on Salem Street, or North Bennett Street, and appraised it at $1.50 a foot, and took a lot at the foot of Hull or Sheafe Street, close by the gas works, what would you appraise it at?

A. I don't think we made very much difference where the house was equally well situated. We wouldn't make much difference until we got up within a few hundred feet of the gas works.

Q. (by Mr. Jewell). When you say "we," you mean the Assessors, in making your valuation?

A. Yes, sir.

Q. What do you mean by a "few hundred feet"? Two or three hundred feet? Up as near as you are?

A. Yes. I know that the valuation of property along there has been decreasing. Almost every year we take off a few hundred dollars.

Q. (by Mr. Hyde). When you got within two or three hundred feet, what would be the difference?

A. I think you could post yourself much better by referring to the book. There are the figures. They will speak for themselves. You can follow the books right through. We go through one side of a street and then the other, and follow down. You can trace the whole thing out in every street.

Q. (by Mr. Stevens). Do you remember what you taxed the Gas Co.'s property at?

A. No, I don't. It was increased in value in the full board.

Q. (by Mr. Curtis). Didn't you assess those estates on the east side of Prince Street, next adjacent to where the gas works now are, at about $2.50 a foot?

A. That was not taken by me. Mr. Fessenden took that part.

Q. Does it not come within your knowledge that it was assessed at about $2.50 a foot?

A. It was a pretty nice point to know how to tax the Gas Co.— whether to tax it for what it is worth for the present purpose or for some other purpose. We had to fix that up the best way we could. If we fixed the value upon what it would bring if we put it into the market to be used for the same purpose that it is now occupied for, it would bring a very big price.

Q. You understand, then, that the value of the real estate has decreased very much for building purposes, while it has increased in value for the purpose of gas works?

A. Yes, sir.

Q. And it has not depreciated for mechanical purposes?

A. No, not particularly, I should suppose.

Q. (by Mr. Hyde). Suppose the gas works were moved out of that neighborhood, and the manufacture of gas prohibited there, what would be the effect upon that portion of the city, either in the character of the occupancy of the dwelling-houses, the character of the business carried on there, or the increased value of property?

A. Well, I think it would give an impetus to various kinds of business. If it wasn't for the gas works, I think they might tear that hill down, the same as they have torn down Fort Hill, and there would be great improvements made there. The North End

is so run down, it is very hard telling how soon it would increase in value, but the tendency would be, I think, instead of running down, to run up, if it was not for the gas works.

Q. What is the depth of water off those wharves there?

A. There is abundance of water.

Q. (by Mr. Curtis). Suppose the Gas Co. were to build a continuous block of model lodging houses upon Snowhill St., so as to stop up that gap there, would not that protect Sheafe St. and the streets round about there, to a considerable extent, from the fine crock and dust?

A. I think not, because the chimneys are so tall that the west wind would bring it over them unless you built your houses higher than the chimneys.

Q. Is it your idea that you get the dust from the top of the chimney?

A. I never studied into that matter. I know it comes from your premises.

Q. Didn't you have a lucifer match factory there?

A. There used to be one there.

Q. There is another factory there now, isn't there?

A. There is a tin shop there.

Q. They make smoke, don't they?

A. Not but very little. They use hard coal.

Q. There are other factories all about there — in Charlestown St., for instance?

A. That is a good deal farther off. That is a different part of the city. It is up near the depots. There are a good many manufactories there.

Q. Wouldn't the property round about the jail in Cambridge St. rise in value for dwellings if the jail were removed?

A. I think it would be no disadvantage, at any rate. Still, I think that is not a parallel case, by any means.

Q. (by the Chairman). If property at the North End has been depreciating, as you say, for forty years, on account of the gas works being located there, if they had not been there during these forty years, would not the high land there and the sea view have attracted a class of houses to the North End for dwellings costing from 20 to $30,000? and if so, what would have been the effect upon the class of houses erected upon the lower territory?

Would it not have induced others to build houses of $10,000 and $5,000 in value? In this way you can get at what the depreciating influence of the gas works has been there for forty years.

A. If it had not been for the gas works, I think a good class of houses would have been put up at the North End, and it would have been one of the most pleasant parts of the city. I have no doubt that the downfall of the North End can be traced to the gas works.

Q. (by Mr. Jewell). What do you trace the downfall in the value of the property on Fort Hill to?

A. I have never studied into that subject.

Q. Until it began to be used for stores, didn't it depreciate as much as Copp's Hill?

A. Well, the Irish worked in there.

Q. Isn't it that that does it instead of the Gas Co.?

A. I think the Gas Works crowded out our best citizens, and it has given room for the Irish to take their places.

Q. There were no gas works to crowd them out on Fort Hill were there?

A. That can be traced to another cause, probably.

Q. Were not the dwellings on Fort Hill much more elegant and expensive than ever Copp's Hill had?

A. I can recollect when it was a very nice place there.

Q. Wasn't that the Court end of the town a hundred years ago?

A. I think not so much as the North End was.

Q. Early, Copp's Hill was among the best parts of the town, wasn't it?

A. Yes, sir; North Square in particular.

Q. Don't you remember structures on Fort Hill as elegant as there are on the top of Beacon St.?

A. I know there were a great many very fine residences there, and it was a very respectable place.

Q. Would not the same causes that depreciated the value of property on Fort Hill depreciate the property on Copp's Hill, without the gas works?

A. I think there is double the territory at the North End there is on Fort Hill.

Q. Has not Salem St. very largely depreciated in the character of its population within twenty years?

A. I should say it had, considerably.

Q. Has not Hanover Street depreciated in the same manner?

A. Business has worked in there. It used to be occupied for dwelling-houses; it is now used for stores.

Q. Have not the streets at the North End, at a distance from the gas works, all depreciated in the character of their population?

A. I should say they had.

Q. Have those streets depreciated more than Fort Hill had three or four years ago, prior to the time they began to make the improvements there?

A. At Fort Hill they are nearly all foreigners, and they are not at the North End.

Q. Then the North End has not depreciated so much as Fort Hill?

A. No, not taking the whole.

Q. Is not the Gas Co.'s property appraised very much higher than the other property at the North End?

A. I think, when we figured upon the value, we did appraise it more. The fact is, it is all guess work — the whole thing — so far as the value of the property there is concerned.

Q. As a matter of fact, you value the land in one sum and the structures in another, don't you? You have to by law?

A. Yes, sir.

Q. Didn't you value the land very much higher than anybody's else in the neighborhood?

A. I think we did.

Q. Suppose these works to be driven away, would the aggregate valuation of Ward Two be diminished thereby or increased?

A. I think it would be increased, from the fact that I think it would bring in there a new impetus.

Q. What?

A. Particularly for dwellings.

Q. Do you think the character of the population would improve?

A. I do.

Q. What causes would operate there that did not operate on Fort Hill?

A. Perhaps I ought to qualify that by saying if the gas works had not been there. At the present time, things are so deteriorated, it is hard to tell what would be the result.

Q. Suppose the gas works were discontinued to-day, is there any thing that would operate to increase the value of Ward Two more than there was in operation to increase the value of Fort Hill?

A. So far as regards the comparison between Fort Hill and North End, I don't know much about it.

Q. Would not that property, if given up for the purpose of making gas, be necessarily used for some other mechanical purpose?

A. I think it is more than an even chance that it would be, — particularly down where they are located.

Q. Is there any probability that, if the gas works were discontinued, any thing less objectionable would take their place?

A. Yes, sir. I think there are various kinds of mechanical business that would not be so objectionable.

Q. But the population collected around them would be working people only, wouldn't they?

A. It rather looks at the present time as though they would. But if they commenced putting up good buildings there, if they should be disposed to use some capital there instead of going to the South End, they might build it up.

Q. Is there any thing to induce people to put good buildings there?

A. There isn't now.

Q. Any thing more than to put good buildings on the whole line of Commercial St.?

A. I think there is, because there is no more pleasant part of Boston than the North End, if every thing was pleasantly situated.

Q. Is there any thing to induce the erection of good buildings there more than there was to keep the good buildings that were erected on Fort Hill, High Street, and Purchase Street?

A. I think there is.

Q. What is it?

A. In the first place, there are stores all round Fort Hill, and there are five foreigners on the same territory to one at the North End.

Q. (by the Chairman). It is not many years since the land in the rear of the State House was vacant — few buildings upon it, and but few on Beacon St. Suppose one quarter of the families on Fort Hill had bought the Beacon St. land, and in the rear of the State House, and left Fort Hill, and the houses they left had been taken by Irish families, would not the fact that quarter of the houses were occupied by Irish families have driven out the re-

mainder of the aristocracy very rapidly, and left the whole of Fort Hill to the Irish population?

A. There is no doubt about that. That has been just the effect there at the North End. When a North End man, who had lived there for years, had given up his house and moved to the South End, the probability was that some foreigner would step in and take his place, and that perhaps would drive out somebody else next to this house.

Q. Your experience is that that did take place on Fort Hill — as Irish families came in, American families left?

A. There is no doubt that was the cause of Fort Hill running down as it did.

Q. (by Mr. Curtis). Suppose we reverse that supposition, and suppose that a few of the people now living on Mt. Vernon Street should leave, and the Irish come in, what would be the effect produced by that on the remaining families on Mt. Vernon Street?

A. It would depend a good deal upon the character of the families. I think they wouldn't back out quite so easy. I think if they should move in there, and there should be a dozen families in a house, that they would finally rout them.

Q. Then it follows, as a general proposition, that where the Irish population come in, the others move away, and the value of the land diminishes, don't it?

A. I think it is very apt to be so.

Q. (by Mr. Stackpole). And the cause that brings the Irish population here is at the root of it, after all, is it not?

A. Yes, that is so.

Q. Have you any doubt, that whatever may be the cause of the depreciation of real estate in other parts of the city, the depreciation of the value of land immediately round the gas works at the North End is due to the gas works being there?

A. I think that is well understood. That is my opinion.

Q. (by Mr. Stevens). Notwithstanding the dust and other inconveniences, you have not seen fit to move away?

A. That is a fact.

Q. You can stand it?

A. I can stand it; I am not there much; but my wife has done her best to get me away from the North End; but I have strong

attractions there. We have some east winds, and then we ain't troubled so much.

Q. (by Mr. Curtis). Are the winds that trouble you any worse than the south-west winds down on Commonwealth Avenue?

A. I should hope they weren't.

TESTIMONY OF CHARLES E. WIGGIN.

Q. (by Mr. Stackpole). Where do you live?

A. Sheafe St.

Q. And what is your occupation?

A. Crockery-ware.

Q. Do you own any real estate on Sheafe St.?

A. Yes, sir.

Q. How much do you own?

A. I own the house I occupy.

Q. How near are you to the gas works?

A. About as near as from here to the further side of Court St. corner of the avenue. Something more than a stone's throw — a stone and a half throw — to touch the gas works; I am not speaking of the centre.

Q. What is the effect of the gas works on the value of real estate?

A. I think it has been very injurious indeed. I went to board on that street in 1828, and have been there almost all the time since; not all the time.

Q. Have you been conversant with the value of real estate during that time?

A. Yes, sir; I have.

Q. How great has been the depreciation?

A. Well, it is a very difficult question to answer, because, since I have been acquainted there, real estate would necessarily have advanced very much ordinarily, as it has in other parts of the city. The more proper question is, how much has it prevented the advance of real estate?

Q. Will you answer that question?

A. That is a very difficult question to answer. I have reflected upon it. The house I occupy I think I gave $6,500 for. I believe the assessors value it as high as they can, and I think they value it at $5,500. I think that house would be worth to me to-day, as

a dwelling-house, had the gas-house, perhaps not been there, or had not something occurred to prevent the North End from going forward from $10 to $12,000.

Q. If the gas works should be removed, would it tend to increase the value of real estate there?

A. I think so, sir.

Q. Whether or not it would bring a better class of population there, on the whole?

A. It would have retained a better class of population, decidedly, and would have largely brought in a better class.

Q. Supposing the gas works to be removed, do you think it would bring in a better class of people?

A. Well, the gas works are a great nuisance, sir, in that section of the city, with the dust and smell continually, to everybody, and particularly to persons in poor health. I experience it in my own family.

Q. Are you annoyed by the dust?

A. Oh, yes, sir.

Q. How does it annoy you and your family?

A. When clothes are put out to dry, it frequently covers them with smut so much as to oblige us to take them in and wash them over again. If a front window is open on Sheafe Street, and a body is sewing, frequently (especially when the wind is in a particular direction) the fine dust and stuff will come in and cover up the cloth, so as to appear very readily; so much so that we have to close the windows, even in warm weather. That is what I meant by saying they were injurious to health. Of course that dust must be inhaled.

Q. Have you felt it injurious to your own health?

A. My mother-in-law has been troubled with asthma for many years; she is now probably near her end; and for years she has complained of that gas house as a great nuisance to her, from the dust and smell.

Q. How does the smell affect you?

A. It is very offensive at times. It is like the gas you inhale sometimes from a coal stove. At other times not so much so.

Q. What class of people has the erection of the gas house brought into the houses immediately round the gas house?

A. At the present time, I should say they were a lower class of people, what we would call a common class of people, directly round the gas house.

Q. Have you any doubt that the depreciation in the real estate in that vicinity is owing to the gas house?

A. I have no doubt that has been a very important cause of its depreciation. I am not willing to say that it is the only cause.

Cross-examined by Mr. Jewell.

Q. Was there any cause at work on Fort Hill that did not operate equally on Copp's Hill?

A. Well, I am not sufficiently familiar with the causes there to answer the question.

Q. Within your remembrance, did not that property on Fort Hill contain some of the finest houses in the city?

A. Yes, sir. Once, when I was clerk with Mr. Briggs, I lived with him there.

Q. And there were very expensive and costly houses there?

A. Yes, sir.

Q. And they all ceased to contain American occupants, fell into the hands of the Irish, and depreciated very largely in value?

A. I think so.

Q. Is not the laboring population on Fort Hill much greater than on Copp's Hill?

A. I should think it very likely. I presume there are a great many very respectable families residing at the North End.

Q. Were not Federal Street, High Street, and South Street all affected in the same way?

A. It is too large a question for me to answer without looking into the matter. I should want to take time to examine it.

Q. Salem Street has depreciated within your memory?

A. Yes, sir.

Q. That is without the range of the immediate effects of the gas works?

A. No, sir. Salem Street running from Hanover to Charter Street, and the gas works continually pouring out their nuisances right on the line, it is entirely impossible to protect Salem Street from them.

TESTIMONY OF JAMES FEELEY.

Q. (by Mr. Stackpole). Where do you live?

A. 560 Commercial Street.

Q. Do you own any real estate at the North End?

A. Yes, sir.

Q. How much?

A. I own 15 houses on the corner of Charter and Commercial Streets. I leased them some 17 years ago. The lease was to run out next January, and I thought I could sell the houses to the owner of the land, but I couldn't; the party that had the fee of the land wasn't able to buy, and I had to make a trade for the land with him; and during these 17 years, the gas works, and other causes which belong to the city of Boston, it has depreciated gradually, but since the war commenced, it has been the worst. The gas works every year increase their work, I should think six benches of retorts within the last four years, as well as I could keep the run of them, and I have kept the run of them pretty well — as well as I could; and I think the coal that is burned since the war commenced makes it worse. The smoke that comes from the gas house I could get along with, and the dirt I could get along with, but the purifying house on the wharf is choking me; and every winter, when they have more to do, it makes me worse. The doctor says I must move my child away from there. There was a man by the name of Burnett that lived next door to me, who had to move his child to Charlestown, by the advice of the doctor, and it got better when it was taken away from there. I have been one year in a vitriol factory in Roxbury, after I came over; I believe it was removed for a nuisance; it isn't to be compared to the purifying house that is on that wharf, where they make their luting.

Q. Has the value of your 15 houses depreciated in your judgment?

A. In my judgment, I have lost by the gas works lately, from $1,000 to $1,500 from rents. Almost every Yankee that was down there has left, except Mr. Giles, and he has got a span of horses to drive him out of town, so that he sha'n't get choked the same as I am.

Cross-examined by Mr. Curtis.

Q. Your houses are what is called the North End Block?

A. Yes, sir.

Q. On leased land?

A. It was leased land.

Q. You now own the land?

A. Partly.

Q. You say you don't like the smell?

A. No, sir. This morning I went in to investigate it, and when I went in where they were making the luting, the water fell from my eyes.

Q. That is on the other side of the street?

A. Yes, sir. My store is right opposite to it, and when the wind comes from that way, it drives the smell right into my door. I have to sleep in my store, and it's choking me. If anybody doubts it, let him sleep in my store two or three nights, and he will soon know.

Q. About 1865, didn't you have the city down upon you for keeping a nuisance down there?

A. No, sir; the Gas Company was the cause of it.

Q. Did the Gas Company keep the cattle down there?

A. No, they weren't down there but two days. I didn't know the market day, and I had no place to drive them into but there, and I kept them there for two nights, and then they complained of me.

Q. About 14 head of cattle in your premises, weren't there?

A. There was double that, I believe. I have been talking with the night-soil men, and they say they are healthy there, but I know James McGuire lost his life there by the smell; I knew a man by the name of Dougherty to lose his life, and another man, whose name I don't remember; and the man, who comes in James McGuire's place, whose name is Dyer, in my opinion, will be dead in three years from now.

Q. It was the Board of Health that cleaned you out?

A. Yes, sir, they attempted it.

Q. Didn't they succeed?

A. No, sir.

Q. Was it too dirty?

A. If you will put some decent questions, I will answer them.

Q. Didn't they warn out every one of your tenants?

A. They did, sir.

Q. Didn't you compromise the matter by cleaning up the premises?

A. I did not. I brought doctors there and showed it was clean. It was done by the city thief, Mr. Forristall, because I went at

him for stealing the city hogs; and when he found the cattle were there, he came upon me.

Q. And Mr. Forristall, the head of the Health Department, cleaned it all up for you?

A. No, sir.

Q. It was cleaned up, wasn't it, and the hogs taken away?

A. All the hogs I knew about being taken away were the hogs Forristall carried home with him — stole them from the city. There is another thing that I forgot to tell. If a woman throws a dish of water into the street, she is sure to be complained of and prosecuted, when the gas works will pump their tar water and let it run in the street by my store down to the sewer, and they are not prosecuted. The workmen and the bosses, part of them, make their brags that the City Government has shares there, and they can do just as they please.

Q. (by the Chairman). That is Mr. Giles, I suppose?

A. Mr. Giles is the great cause of complaint so far as the character of the workmen is concerned. I have known them to go out and knock a man down on the bridge, rob him of his papers and money, and then some of the bosses would go their bail, and the next day they will be at work again. I will refer to the books and show you where thirty men have been dismissed for misdemeanors and taken back again. That is the class of people that is kept there. There are some good, honest, hard-working men there, but there are some others that are different. I think real estate would come up twenty-five per cent within three years from to-day, if the gas works were taken away. I would build a good block on Charter Street, if the gas works were removed.

Q. The Hull Street harlots are very troublesome down there, ain't they?

A. Yes, sir, the harlots, the thieves, and the gas works.

Q. (by Mr. Stackpole). You class them all together?

A. Yes, sir; and the gas works in that vicinity are the worst of the lot.

TESTIMONY OF BENJ. FESSENDEN.

Q. (by Mr. Stackpole). Where do you live?

A. On Charter Street.

Q. How long have you lived there?

A. Thirty years.

Q. What is your occupation?

A. I am not in business now.

Q. Are you one of the assessors?

A. Yes, sir.

Q. Then you are acquainted with the value of real estate in the neighborhood of the gas works, are you?

A. Yes.

Q. In your judgment, what is the effect of gas works upon the value of real estate in that vicinity?

A. I think it is depreciating in its general effect. That is one of the causes which has operated to depreciate it.

Q. Can you form any estimate of the depreciation?

A. Well it would be only a random guess. I should suppose, however, that in the immediate vicinity of the gas house, say within a square immediately adjoining it, it would not be far out of the way to say it had depreciated from that cause probably ten per cent. Other causes have operated, but that I should say had depreciated it as much as ten per cent, in the immediate vicinity — on Sheafe Street in particular.

Q. In your judgment, if the gas works were to be removed, would it tend to increase the value of real estate?

A. It is rather hard telling what would be the effect of a change of that kind. Building materials are so high now that it might be some little time before it would increase.

Q. Would it in the long-run?

A. I think it would in time.

Q. How near are you to the gas works?

A. I can't tell the exact distance; probably an eighth of a mile.

Q. Are you so near as to be annoyed by the dust and smell?

A. That side of the hill, the gas doesn't reach so very much. We have something of it, but very little that is troublesome. We are not materially troubled.

Q. What is the effect of the gas works extending their domain?

A. Well, sir, I don't know as I could tell that because it has not extended sufficiently of late to make any material difference; but I suppose the nearer you approach any dwelling-house, the greater the difficulty would be from the gas house. By pulling down one house, the smell of the gas would extend to the next one a little more.

Q. What has been the effect of the gas house in regard to the character of the population there?

A. Well, I think that is one of the effects it has had — it has driven the better class away. Of course, there are some other causes for that, but I think that was the primary cause of driving off the best class of citizens from that portion of the city.

Q. The employees of the gas house, I suppose, have to live there?

A. Well, they do. I don't know whether it is absolutely necessary they should live within a stone's throw or not, but they do.

Q. (by the Chairman). If the gas works had not been located where they are, would the real estate in that neighborhood have kept pace with the increased value of real estate in other parts of the city during this year and last, more especially this year, 1866?

A. I don't think it would in the same ratio, not to the same extent. It would probably have rather advanced, but not to the same extent that it has in other portions of the city.

Q. I don't mean in the same ratio with Summer Street, where it is so attractive for stores, but taking the city in general?

A. I don't think it would quite to that extent that it has in the major part of the city, but it would to some extent. The narrow streets of the North End is one reason why it would not have advanced at the same rate.

Cross-examined by Mr. Jewell.

Q. What proportion of the territory of Ward Two, do you think the gas works cover? It is a small portion compared with the rest of the real estate in Ward Two, isn't it?

A. Well, their works cover about three acres — very near that, the whole. I can't tell what the whole ward is.

Q. Don't you appraise the property of the gas works much higher than you appraise the other property in the neighborhood?

A. No, sir, I should think not.

Q. Somewhat higher don't you?

A. We may appraise it a little higher, possibly a little.

Q. About how many acres should you judge there were in the present boundaries of Ward Two?

A. I should say there were twenty. It is mere guess work. [The ward was pointed out to the witness on the map of Boston.] It is a much larger territory than I thought. There may be one hundred and fifty acres.

Q. What is the total valuation of the real estate of Ward Two this year?

A. I am not able to tell you. The last time that I knew what it was, was under the old arrangement, before the boundary was altered. It was then about thirteen millions. Now the territory is doubled, and it must be, probably, about thirty millions, at a guess. I have not seen the books footed up, and don't know.

Q. What is the valuation of the real estate of the gas works in Ward Two?

A. Not far from $1,200,000, I think; I am not positive.

Q. You say that the depreciation of property about one square distance from the gas works, in your judgment is ten per cent?

A. Yes, sir, I should say to the extent of one square adjoining, it was ten per cent, or near that.

Q. The territory occupied by the Gas Company, if it is three acres, is about one-fiftieth part of the whole ward?

A. I remember pretty near their quantity of land to be three acres.

Q. That would be one-fiftieth part of the whole territory of the ward, if there are one hundred and fifty acres in the ward?

A. That is a mere guess; I can't say, sir.

Q. That being valued at $1,200,000, if the rest of the ward was valued as the Gas Company's land is, it would be sixty millions instead of thirty, wouldn't it?

A. I supposed, when you asked me of the relative value, you referred to the value of the land. The works upon the land, as more expensive, of course, should be valued higher than an ordinary dwelling-house. There are expensive works on this land, but the land itself we reckon at about $2 a foot, and I think that the land on most of the streets round there would average that. There are many streets where it wouldn't sell for a dollar.

Q. Where is that?

A. The city sold some on Salutation Street, I believe, recently, for a dollar, and that was in the immediate neighborhood of the wharves.

Q. What other streets have a low valuation of the land?

A. On Henchman Street, I don't think you could sell the land for a dollar.

Q. Are there many parts of the ward where land is as low as a dollar a foot?

A. No, sir, there are not.

Q. Or $1.25?

A. There are considerable many streets where it is as low as $1.25.

Q. And very many where it is as low as $1.50?

A. Yes, sir.

Q. Is not the land about the Gas Co.'s works, then, more valuable than the majority of the land in Ward Two?

A. Well, it might be, because a large part of it is pretty near deep water. The value of land on Hanover St. is from $4.00 to $5.00 a foot.

Q. But the land immediately about the Gas Co.'s works is a good deal more valuable than the land in a great many other streets in Ward Two?

A. I don't think it is now, sir.

Q. You assessed the estates that the Gas Co. have bought, but have not yet used, at $2.50 a foot, didn't you?

A. No, sir.

Q. How high?

A. It varies from $1.25 to $1.75.

Q. Is not that on the opposite side of the street?

A. No, sir. Well, it is across the little narrow lane which runs from Snowhill Street to Prince Street, but not across the street.

Q. Don't you recollect that you assessed the new purchase of the Gas Co., on Prince Street and Snowhill Street, the land where the houses stood, which they have not yet occupied, or had not then, at $70,000?

A. We assessed those all separate houses, the same as they were before the Gas Co. bought them.

Q. Was not the aggregate about $70,000?

A. I never footed it up; I don't know what the amount was.

Q. (by Mr. Stackpole). You mean that the houses and land were assessed separately?

A. I mean that the houses and land were assessed separate.

Q. (by Mr. Jewell). I am asking about the $70,000?

A. I don't know what the whole amount was, whether it was $50,000 or $70,000.

Q. You took the same valuation as last year?

A. Very nearly. There was a trifling depreciation on some houses, but no great.

Q. (by Mr. Hyde). How long have you been an assessor?

A. Eleven years.

Q. How long have you resided there?

A. Thirty years and six months.

Q. What was the effect of the gas works when they first began to manufacture gas, if you can remember back thirty years?

A. I didn't experience any injurious effect from them for a period of five or six years from the time I first moved there.

Q. Did you hear any complaints in the earlier years of the establishment of the works there?

A. Yes, sir. I did about that time. I don't know precisely what time they commenced.

Q. And have these complaints increased as the gas works have increased?

A. Yes, sir, I think so.

Q. (by the Chairman). If gas works of the magnitude of those at the North End were placed upon Charles Street, what, in your judgment, would be the depreciation in the value of real estate on Beacon St. and Beacon Hill?

A. Well, sir, I should think it would depreciate it one half.

Q. (by Mr. Stackpole). In the appraisal you have placed on the gas works, you have not simply estimated the land, but the value of their buildings and machinery?

A. The buildings, and whatever stands on the ground, which comprehends the retorts, a large number of them, and all the structures.

Q. So that, in taking the amount for which the gas works are taxed, with reference to the total taxation of that section, you take into consideration not simply the land, but all those valuable structures on the land?

A. Yes, sir. If my memory serves me, we valued the land and buildings, structures, retorts, and all, at about $7.50 a foot, upon one square, of about two acres. The wharf property, I think, does not amount to so much as that.

Q. You have been asked by Mr. Jewell in regard to the lower valuation of land in that vicinity. Whether or not the land in the immediate vicinity of the gas works, if the gas works were removed, would be more valuation in itself than the land which you have said was taxed at $1.00 and $1.25?

A. I think if the gas works were out of the way, there would be no land round there but could be sold for $2.00 a foot.

Q. It would be twice as valuable as the land now assessed at a dollar?

A. I think so, sir. I remember that about 1836, there was some land sold for building purposes on Charter Street. I can't remember exactly what it sold for, but I think $1.12½ a foot, a part of it, and $1.25 another part. I recollect that in 1866 some land was sold within 200 feet of that, on the same side of the street at auction for 53 or 52½ cts. a foot. The estates were so near together that that would afford a comparison. The last sale was at auction; the sale made in 1836 was a private sale.

Q. (by Mr. Jewell). Do you know any other place in the city of Boston where gas works could be placed, where they would not injure the inhabitants and deteriorate the value of property?

A. I do not, sir.

Q. Wouldn't they be equally injurious anywhere in the city?

A. I think they would.

Q. (by Mr. Stackpole). That is inside the city?

A. Yes, sir.

Q. (by Mr. Jewell). Is there any place in the vicinity of Boston where they could be placed, to your knowledge, without depreciating the value of the property?

A. I don't think there is in the city proper. In East Boston there is Breed's Island, that perhaps it wouldn't injure quite so much.

Q. Is there any place within three or four miles of the city of Boston where gas works could be built, where property would not be injured by them?

A. I don't think of any, sir.

Q. (by Mr. Stackpole). I suppose if they were located on vacant land, where there was not a large number of people

around they would injure property less than where the population is thick?

A. If there was a sparse population, of course it would injure it less than where the population is thick.

Q. (by the Chairman). I suppose, if the gas works were removed three or four miles from the city upon a farm where the land is sold by the acre, the depreciation would not be so much?

A. I suppose not, if you put them on land that was only good to raise grass for milch cows.

TESTIMONY OF S. A. STETSON.

Q. (by Mr. Stackpole). You live in Boston, I believe?

A. Yes, sir.

Q. What is your occupation?

A. Gas fitting and dealing in gas fixtures.

Q. Whereabouts is your store?

A. 350 and 352 Washington Street.

Q. That is in the neighborhood of Boylston Street?

A. Yes, sir; about five rods this side of Boylston Market.

Q. Have you a water gauge for measuring the pressure of gas?

A. Yes, sir; we have it for our own convenience, to test burners, &c.; to know what pressure we are testing them under.

Q. Have you taken any observations of the pressure of gas lately?

A. I have.

Q. Will you please give them to the Committee, if you have any memorandum of them?

A. Tuesday, Dec. 4, at 4 o'clock, P.M., the pressure was $2\frac{3}{4}$ inches; at 5 and 6 o'clock, 1 inch. Wednesday, 5th, at 11 o'clock, $2\frac{3}{4}$ inches; 1 o'clock, the same; 5 o'clock, $1\frac{1}{4}$ inches; quarter past 6, $1\frac{1}{4}$; quarter past 10 in the evening, $2\frac{1}{4}$. Thursday, 6th, at 12 o'clock, it was $2\frac{3}{4}$; at 3 o'clock, the same; ten minutes past six, $1\frac{1}{2}$; twenty-five minutes past 8 in the evening, it was 2 inches. To-day, the 7th, at 9 o'clock, $2\frac{3}{4}$; 10 o'clock, $2\frac{7}{8}$; 5 o'clock, $1\frac{1}{4}$; quarter past 6, $1\frac{1}{2}$; 7.55, $1\frac{7}{8}$. That is the latest information I can give you.

Q. Have you observed the gas burning late in the evening, 11 or 12 o'clock, with your eye?

A. I have casually noticed it in my own house, in places of business and public halls where I have been.

Q. How is the pressure late at night?

A. I should say that the pressure late in the evening is very great. I can't tell you from having tested it, but from observation, the pressure is very great.

Q. So that a gas burner, if lighted at six or seven o'clock, if not turned down, would blow?

A. Yes, sir. I was called to look at a room once, perhaps two or three years ago, where a gentleman boarded in a hotel. I had done the work in that hotel, and I was sent for to look at the room. The gentleman occupying it went out in the early part of the evening, and turned the argand burner as low as he could and have any light. He didn't come back until 12 o'clock, and then he couldn't tell whether the bed-clothes were white or black. It was impossible for him to stay in the room. When I went in in the morning, every thing was as black as though it was hung in drapery.

Q. How would the pressure compare with the pressure on higher land?

A. I suppose it would be greater.

Q. Do you know the proportion it rises?

A. I do not. We test the gas for our own convenience in testing burners. That is why we have this gauge.

Q. Is the apparatus correct?

A. I can't say. It is correct as far as I know. It is the same apparatus we generally use, and what is generally used by people in our business.

Cross-examination by Mr. Curtis.

Q. The reason why the pressure is so high in the daytime is because there are no lamps lighted to reduce it?

A. I presume so, sir. There is no doubt about it. It is not always so high in the daytime as I have got the register there for the last two or three days.

Q. Every one of the figures you have given have been the highest by daylight?

A. Yes, sir.

Q. That is because there are no lamps burning?

A. It is generally the lowest when we begin to light up in the evening; after we have been lighted half an hour.

Q. After everybody else follows your example?

A. I presume so, sir. It is very natural for people to light up when it becomes dark.

Q. As the lamps are put out, and the theatres close, then the pressure begins to increase again?

A. I suppose that would be the natural consequence.

Q. Whether the natural consequence or not, is it not so?

A. Yes, sir, I believe so; it is my judgment.

Q. Then the pressure would not be higher later in the night than in the daytime?

A. That would depend upon circumstances, I should think.

Q. Should you suppose that the person you spoke of who left his room with the gas turned down, was a careless or careful man?

A. I don't know him. He was a boarder there.

Q. If he had left that burner with the cock open, and the gas not lighted, could he have lived in the room when he got back?

A. I shouldn't suppose he could, unless the room was well aired.

Q. That is an accident that sometimes happens in every family?

A. Yes, sir, very often.

Q. (by Mr. Stackpole). The light had been turned down, hadn't it?

A. So I understood. He didn't tell me so. He represented to the landlord that it had been turned down to a blue light.

Q. (by the Chairman). I suppose the pressure is greatest just before lighting, and in the evening when they begin to turn off the lamps in the stores and places of amusements?

A. The pressure would increase very materially then. I have observed it a great many times when I have been in halls and places near the Boston Theatre. Of course, when they begin to turn out the lights, the lights all over the neighborhood begin to come up. I can tell almost to a certainty when the theatres close by the pressure on the gas.

Q. I suppose the great pressure during the daytime is owing to the pressure required to force the gas to distant parts of the city through the pipes, and the very little consumption going on?

A. That is what I have supposed.

Q. (by Mr. Hyde). Can you give any opinion whether, under this pressure, gas escapes to any extent during the day?

A. It depends a great deal upon the character of the fixtures,

and how they are turned on and off. If the fixtures are perfect, then no gas escapes; if the fixtures are worn out and the cocks get loose and used up, the gas is escaping continually.

Q. If you put in new fixtures and put them in properly, under this pressure will gas escape to any extent?

A. I should think not.

Q. (by Mr. Jewell). The gas would escape with a lower pressure, if the fixtures were imperfect?

A. I should think not. The higher the pressure, the more gas would escape, of course.

Q. But if the fixtures were imperfect, the gas would escape?

A. It would escape with any pressure, but the higher the pressure, the more would escape.

Q. (by Mr. Curtis). You could regulate the pressure, for instance, over this table, by turning the cocks?

A. You can turn the pressure from the burners.

Q. (by the Chairman). If I was to settle my gas bill up to the first day of May, and then leave the city, and come back the first day of October, and go on consuming the gas after I arrived at my house, would not my next gas bill be greater than it would if I had shut my gas off, between the meter and the street?

A. When you go away, you should always turn the gas off, and not have any come into the house. That is a precaution that I advise every one of my customers to take. I never connect a meter without leaving a wrench to shut the gas off from the meter. That is a rule of the establishment; and I always recommend my customers, if they have got any leaky fixtures that we cannot attend to the moment they come in, to go and turn off the gas and keep it turned off in the daytime.

Q. Don't you think my bill would be less from the fact that I turned it off behind the meter?

A. Yes, sir.

Q. (by Mr. Curtis). Would not that depend upon the condition of the Chairman's fixtures?

A. To a great degree. Entirely upon that.

Q. (by the Chairman). If I was to burn my gas under a $2\frac{1}{2}$ inch

pressure, and was to turn the faucet behind the meter at an angle of 45 degrees, would I not decrease my bill 30 or 35 per cent during the quarter?

A. It should be reduced so.

Q. It would be much more economical to the consumers of the city if they were furnished with rich gas, and burned it under a low pressure?

A. Yes, sir; very much.

Q. (by Mr. Curtis). Supposing the pressure in the street is indicated by the pressure gauge at 2½ inches, is there a pressure of 2½ inches as it comes out of the burners in this room?

A. We should screw the apparatus on the nipple, not on the burner. The pressure would be the same coming through the apparatus on the nipple as it is coming through the burner.

Q. Could you burn such gas as is made in this city now at a pressure of 2½ inches?

A. I should think it was too great a pressure.

Q. It would smoke?

A. It would smoke, and the gas would be wasted.

Q. Could you turn it off so it wouldn't smoke?

A. Then the pressure is reduced below 2½.

Q. It would come through the cock still?

A. Yes, sir.

Q. It is impossible to burn the gas with these common fish-tail burners at a pressure of 2½ inches?

A. I think it is, and consume the gas.

Q. (by Mr. Stackpole). You mean, to burn it economically, not positively impossible?

A. No, sir.

Q. (by Mr. Hyde). Have you been in the habit of personally visiting the premises when you put in gas fixtures?

A. I very often do. It is not always that I do, because I have so many people to attend to.

Q. What has been the condition of the meters in those houses where you have been?

A. It is no part of my business to interfere with the meters. Whenever I have been called upon to examine meters for any of my customers, I have declined. I have nothing to do with exam-

ining meters. That is a matter for the Gas Co. Whenever people come to me and exclaim about their bills, I refer them to the Gas Co. That is no part of my business.

Q. Do you hear many complaints about the bills?

A. Yes, sir. Persons come in to make inquiries, particularly our customers.

Q. Are the meters generally, as you find them in buildings, well put up and in good condition?

A. They are generally well set. It depends upon the mechanic who makes the connections whether the connections are perfect or not. Some of them are very imperfectly made.

Q. Does the measurement of gas depend upon whether it is well done or not?

A. I should think not, sir.

Q. (by Mr. Curtis). Whenever you have sent customers with complaints to the Gas Co., haven't you always found them perfectly ready to investigate the matter and do justice?

A. Sometimes they have, and sometimes they have reported that they could get no satisfaction. Sometimes they come in and say that they have had rather insulting answers, &c.

Q. You mean by that, they didn't get their bills reduced, don't you?

A. I do, sir.

Q. But you never found that they declined to investigate a case?

A. I never went to the Gas Co. with any complaint about my own bills. We settle any thing they put before us. Sometimes we think they are pretty steep, but we don't ask any questions. We go and pay them. The only experience I have had with the Gas Co. has been with my own bills. I never have gone there for anybody else, or gone with anybody.

Q. (By the Chairman). If all the Gas Co.'s meters in Boston were set in an even temperature, say sixty-five degrees, would it not be more advantageous to the consumers of gas than having them set where hoar frost would form in the meter if a dry meter, or if a wet meter, the water would freeze?

A. It would be undoubtedly better for the consumer. 65 is higher than there is any need of having it. I think when you get a temperature too hot it is not so economical as one a little

cooler. The hotter you get gas, the more expensive. But when you put meters where it is so cold that hoar frost gets into them and fills them up, you can't get any light. You see that in the street lamps in very cold weather. They are not giving the light of a candle; some of them entirely gone out.

Q. (by Mr. Jewell). That is in very cold weather?
A. Yes, sir.

Q. (by the Chairman). Do you think that hoar frost remains in pipes of our street lamps, when the pipe runs up an iron post, as it does, and diminishes the amount of gas we receive below the amount we are charged with by the Company in the winter months, when it is at the freezing point?
A. Yes, sir.
Q. It diminishes the light of the street lamps?
A. Yes, sir, very materially.
Q. And we don't get what we pay for?
A. Should say not, sir.

Q. (by Mr. Jewell). You can't help freezing it in cold weather, can you?
A. Gas is freezable, sir, because it is a vapor, and when it condenses it turns to frost.

Q. (by Mr. Hyde). Do you believe it would be for the advantage of the citizens of Boston to have a city inspector of the Gas Co.'s meters?
A. I do.
Q. In your opinion, should the city of Boston have an inspector exclusively to itself, who will give them all the information he may acquire in regard to the consumption of gas, the best kind of burners to be used, &c.?
A. I believe it would be a judicious expenditure of money, the salary of such an officer. I think it would be advantageous for the city of Boston to establish such an officer.
Q. And it should be done for their protection?
A. It should be done for the protection of the citizens, and it would save all hard feelings and a great deal of bickering for the Gas Co. I shouldn't suppose the Gas Co. would object to such a thing.

Q. What would be the value of such services? I mean, in what direction would the benefits accrue? What would be the duties such a man should perform?

A. One of the things I would have him attend to would be to look after the gas that the city pays for. I think that alone would save his salary in a year. The city is consuming a great deal of gas here, in the engine houses, in the Court House, in the Tombs, in the police stations, in one room and the entry of every school house, and in various other places that should be looked after. The city is an immense customer of the Boston Gas Light Co.

Q. (by the Chairman). Do you believe we require such an inspector, in order that the people should know the quality and illuminating power of the gas every day?

A. I think it would be well to have such an officer.

Q. (by Mr. Hyde): In what other respects, besides testing the gas and saving the waste, would such an officer be of advantage to the city?

A. It would be an advantage to the citizens to go to this inspector, and his business should be to go to his house and examine his gas fixtures, meter, and every thing, see that they are right, and give him a certificate.

Q. (by the Chairman). When any complaint is made of a meter, should it be the duty of the inspector to go to the house and there inspect the meter without taking it away?

A. He might do it there or take it away, at his own convenience.

Q. Suppose it should be frozen up where it stands, and he should take it away to a workshop, and it should thaw out, and he should then place it on his test table, and find it accurate, would he have any evidence of its correctness from that examination?

A. I should say he would.

Q. How could he when it measured falsely, because of the hoar frost, which thawed out before he tested it?

A. Because they don't adjust meters with the idea that they are going to freeze. It is only a short time of the year that they are troubled that way.

Q. Suppose that hoar frost does form from condensations in the meter, and that makes the meter measure against me from 35 to 40 per cent; would it not be better for the inspector to test that meter where it is, rather than take it away and have it thawed out, so that it will measure correctly when subjected to the test?

A. It would be better, probably.

Q. (by Mr. Stackpole). I understand you to say that the city would save the amount paid for the salary of such an officer by the amount of waste gas that would be saved?

A. Among their own buildings, yes, sir.

Q. (by Mr. Curtis). Could not that duty be performed by one of their own officers?

A. If they have one who is thoroughly acquainted with it.

Q. Is there any necessity of going to the Legislature to get an inspector to do that?

A. I should suppose that could be done by the Corporation.

Q. Did you know there was one already appointed by the State?

A. Yes, sir. I know there is such an inspector.

Q. What additional inspection do you want?

A. He is only to inspect my meter if I go to him and ask him to do it, and pay him for it.

Q. If it is right?

A. Yes, sir.

Q. (by Mr. Stackpole). Is he to give any information to consumers?

A. Not that I am aware of. His duty is to inspect the meters, and he puts the seal of the Commonwealth upon them. As I understand, a Gas Co. is not at liberty to put in a meter without the broad seal of the Commonwealth upon it.

Q. (by the Chairman). If the State Inspector was called to inspect in Springfield to-morrow, could he inspect for the citizens of Boston during the day he was absent in Springfield?

A. Not at all, sir.

Q. The State Inspector is only authorized personally to inspect gas in the whole State of Massachusetts; he is not allowed to have a deputy; therefore could he answer a call for inspection in Boston, when called to Springfield, Lowell, or New Bedford?

A. He couldn't do it.

Q. Supposing we had a man in the city of Boston whose duty it was to look after the interests of the citizens, by the inspection of their meters and the general connections in their houses, what duties could such an officer perform that would be of value to the citizens at large?

A. A man who goes to the Gas Company and gets any thing generally has to take their say so for every thing that comes. Then if there is a city inspector he can go to that city inspector for a verification of the facts, if they can be verified, and if they cannot, then he can get satisfaction.

Q. (by Mr. Curtis). Can't he go to the State Inspector?

A. Not always. I understand that he is not always in Boston. I never went to his office.

Q. (by Mr. Hyde). Is there any such waste of gas, from imperfect fixtures, that such an officer could be of service to the citizens by informing them of it, or is it the case that, throughout the city of Boston the citizens are, substantially, only paying for what they receive?

A. It is a satisfaction to a man to know he is getting all he pays for.

Q. From your knowledge, is there any such imperfection of the gas fixtures, that such a man could be a benefit to the citizens?

A. Well, I should say that there was. It is a matter I haven't given a great deal of consideration to. I should never have thought of it perhaps, if it hadn't been mentioned by the Chairman.

Q. As you from day to day visit shops, stores and dwelling-houses, you are able to judge whether there is a leakage or any of those things whereby a loss is occasioned to the consumer, are you not? As it is to-day, a majority of the citizens I suppose, know little, if any thing about the condition of the gas fixtures in their houses, or the connections with the meter, or whether the meter registers correctly or incorrectly. I suppose they know nothing about it except to turn the gas on and off, and pay the bills?

A. They seldom look at it, I suppose. I know I hardly ever look at mine.

Q. Now, if there was a man to look after these things, would he make enough saving in the consumption of gas to be of substantial advantage to the citizens?

A. I should say he would?

Q. (by Mr. Stackpole). That is in addition to the advantage he would be to the city in saving their gas?

A. Yes, sir. I think that such an officer should be created.

Q. (by the Chairman). Would it not be an advantage to the City if the Gas Company were obliged to have an index register in every house, showing the amount of gas consumed week by week and month by month, so that a family could look at that index register and see how much they had burned at any time?

A. That would produce economy, because persons seeing that they were using a good deal of gas would turn it off.

Q. (by Mr. Jewell). Don't they have this information already on the meter?

A. Yes, sir, but not one in twenty can read it.

Q. But they can learn to read it as easily as to tell time by a watch, can't they?

A. Yes, sir.

Q. (by the Chairman). If the city of London has learned from an experience of a great many years, that it is necessary to have an inspection of gas during the whole day and night, does not the same necessity exist here?

A. I have already said that. I think it would be a very profitable and judicious office to create for the city government.

Q. (by Mr. Jewell). How long would it take to teach any man to read his gas register or his meter?

A. A very few minutes. I don't know exactly how long.

Q. You would undertake to teach any man to do it in a very short time, wouldn't you?

A. Yes, sir.

Q. Would there be any difficulty in setting up a meter in the public schools, and teaching the children to read it?

A. Where the gas came in, I should suppose not.

Q. (by the Chairman). If an index was kept upon the meter and a monthly record kept of the consumption, would it not be a protection to the consumer if, when his bill came in, he could compare it with the corresponding quarter?

A. Yes, sir.

Q. (by Mr. Hyde). Supposing the freezing up in winter is from improper connections or improper placing of the pipes, is there any man to inform the consumer?

A. No, sir, except he sends for the gas people.

Q. As I understand it, if a meter freezes up, the man sends word to the Company and they thaw it out, and he pays the bill?

A. No, sir; the consumer gets no charge, that I know of. They thaw it with whiskey.

Q. (by the Chairman). If the agent of the Company should come to your house to-day and find your meter measuring falsely, he would probably take it down, carry it away, and replace it with another meter, or repair that meter?

A. That would be the natural consequence.

Q. If it has been measuring against you, would he be likely to inform you of that fact?

A. I don't very often hear of those kinds of cases. It is where it measures against the Company that they change a meter, generally.

Q. (by Mr. Hyde). From your observation have you been able to form any opinion as to whether dry meters, as now used, measure correctly?

A. No, sir. I have never investigated that subject at all.

TESTIMONY OF C. T. BENSON.

Q. (by Mr. Stackpole). Where do you reside?

A. Prince Street, 82.

Q. And your occupation?

A. Carpenter.

Q. How near are you to the gas works?

A. Two or three minutes' walk.

Q. Do you own real estate?

A. I do.

Q. How much?

A. A double house, and three small houses in the rear of that.

Q. How long have you lived there?

A. Between 25 and 30 years.

Q. What is the effect of the gas works, in your judgment, upon the value of real estate?

A. Well, sir, if we could tell how much higher it would be if the gas wasn't there, we could get at it pretty nigh. It is rather a puzzling thing to get at. I know Blackstone Street, for instance, has risen five or six times from what it was when it was Canal. I should think it had injured the real estate round there 20 per cent. That is, I mean if the gas house hadn't been there — but it now is. We have got to take the thing as it is.

Q. If the gas works hadn't been there you think your property would have been worth 20 per cent more to-day than it is?

A. Yes, sir, I don't doubt it.

Q. If the gas works should be removed, what effect would it have upon the real estate there?

A. It is something like locking up the stable after the horse is gone. The folks have gone — cleared out; we are an Irish Ward now, and it was fetched about by the gas house, nothing else.

Q. Suppose the gas house to be removed, and the employees of the gas house to remove, as they would in that case, whether or not in the course of time, in your judgment, real estate would rise?

A. There is no question but what it would rise; but the inhabitants that would have staid there if the gas house had not been there, they have gone and located somewhere else. There is no gentleman here in the room but what would be for moving if an Irishman came and opened a groggery, or a cabbage and potato shop next to him. There is no doubt about that.

Q. The question I desire to put is, whether if you were to do the best you could by removing the nuisance, you couldn't improve the state of things?

A. Well, we know how merchants have carried their business up in town on account of the state of things at the North End. We know how Fulton Street is deserted. Merchants have said, "It is a low place to fetch customers." They are ashamed of it. We know that the deep water is at the North End; but how far we should have been ahead in commercial business is a matter that we have got to guess at. But we know that the big ships have to come there now, and we know that almost all the Yankees have moved away, and the Irish taken their places; and some pretty low ones at that.

Q. Still you don't answer my question — whether if the gas works were removed, it wouldn't be better for your property?

A. I think it would be better, a good deal better.

Q. What other evils, if any, do the gas works produce?

A. The inhabitants that it fetches there, and the smut that it spreads far and wide, according to the wind. If there is a high wind it carries it farther off; but it falls somewhere: if there is a calm, it falls near the base.

Q. Are you annoyed by it?

A. I guess I am, a little.

Q. What effect does it have there?

A. If you should rub your hand on a window seat, where the window had been open one day, it would look as if you had been blacking shoes.

Q. Does it affect you clothes and furniture?

A. It besmutches every thing if the window is up. You can test it best after a snow storm. Just go and see what falls on the white snow in one day.

Q. Have you any doubt that the smut comes from the gas works?

A. I have no more doubt of it than I doubt that you are talking to me.

Q. How about smoke? Are you troubled with that much?

A. Sometimes we are, and sometimes we are not.

Q. I suppose if the gas works were removed, the people would be much more willing to live there?

A. I guess they would.

Q. How does the increased domain of the gas works affect the value of real estate down there?

A. The great cry is at the North End, "That abominable nuisance is spreading its boundaries far and wide. I ain't going to stay here. I am going to sell out and go off."

Q. That makes the land cheaper?

A. Yes, sir. That is the way it goes on.

Q. So that the Gas Company, by extending its boundaries, can purchase the land cheaper that it injures?

A. Yes, sir. If there is any nuisance, the more it spreads, the greater nuisance it is.

Q. (by Mr. Jewell). You don't suppose it would improve the North End if the gas works were removed and the land used for mechanical purposes?

A. It wouldn't fetch it to what it otherwise would have been,

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A. Yes, sir, I should judge so. I am sure I shouldn't care to live there. My view is the same as the rest of North End.

THE CHAIRMAN. It appears to me that this evidence from the North End is corroborative, merely, and it does not seem necessary to go on with it any further.

Adjourned to Tuesday evening, Dec. 11th, at 7 o'clock.

TUESDAY EVENING, Dec. 11, 1866.

The Committee resumed the hearing of testimony at 7½ o'clock.

TESTIMONY OF GARDNER WARREN.

Q. (by Mr. Stackpole). Where do you reside, sir?

A. In Roxbury.

Q. What experience have you had in the construction of gas works?

A. I was engaged from 1848 several years in building gas works. I built in ten different cities and towns in the vicinity of Boston.

Q. Which towns did you build in?

A. Roxbury, Charlestown, Lynn, Salem, Great Falls, Marblehead, Taunton, Woonsocket, Plymouth, and Woburn.

Q. What attention have you given, sir, to the building of works for the manufacture of gas?

A. I was constantly engaged in that business some six years, and studied the subject, I suppose, pretty thoroughly.

Q. Would it be practicable, in your judgment, for the city of Boston to erect works in the vicinity of Boston for the manufacture of gas?

A. It would be.

Q. What are the obstacles most prominently in view in regard to the erection of works outside of the city?

A. There are no obstacles, that I know of, at all, if the right location is adopted.

Q. What advantage would gas works located outside of the city have over those located inside of the city?

A. I do not know that they would have any, except in a sanitary point of view. The distribution of gas can be made just as well from works in the city as from works out of the city.

Q. How would it be in regard to economy in purchasing land?

A. The land would cost less, undoubtedly, out of the city.

Q. In regard to having more room to make economical improvements, how would it be?

A. So far as labor and material are concerned, I do not know as it would make any difference, except, perhaps, that it might make more difference in taking the material out of the city.

Q. Suppose the works to be placed in a locality where coal could be delivered as easily as in the city?

A. There would be no difference in cost.

Q. How would it be in regard to the workmen, as to their obtaining board and house rent?

A. They might obtain tenements at a lower rate out of the city than within the city. That would depend upon the location.

Q. Is there any difficulty in the distribution of gas from works located one or two or three miles out of the city?

A. Not any that I know of, except in regard to the size of the pipes. The further you go, the larger the pipes would have to be.

Q. Have you made any estimates of the cost at which gas may be manufactured at the present time?

A. I have thought of the subject some.

Q. Will you state the result of your estimates?

A. I think it would not cost over one dollar and seventy cents ($1.70), allowing nothing for taxes.

Q. Will you state the basis of this calculation? Or, first, I will ask whether that includes the interest.

A. That would include the interest.

Q. How much did you allow, in that case, for the cost of coal and lime? Perhaps you had better go into and tell fully the data on which your estimates were based.

A. I have made an estimate of the cost from the present cost of coal. If 2,000 pounds of Newcastle coal and 240 pounds of Albert or cannel coal are used, it would cost twelve dollars ($12.00) for the coal. If Pictou coal and Albert or cannel coal are used, with the same quantities of each, it would cost ten dollars ($10.00). That is pretty high for the cost of coal. I calculate that the Pictou coal would yield, with the mixture, about eight thousand (8,000) feet to the ton, of a good quality of gas, and the other about ten thousand (10,000) feet. The quality of the gas made of the Pictou and the Albert or cannel coal is not quite

heavy enough. The specific gravity is too light to give a brilliant light.

Q. How would gas made on this basis compare with the gas now used in the city of Boston?

A. About the same, I think. I estimated the cost of the material, or of this coal — the quantity named. It would be a dollar and twenty-five cents ($1.25); that is, the coal costs that; and the lime perhaps five cents (.05) to the thousand, making a dollar and thirty cents ($1.30) for the lime and coal. I estimate twenty cents for the labor, per thousand, not including the salaries of clerks and officers of the company. I would estimate the salaries of clerks at eight cents (.08) per thousand feet; repairs, ten cents (.10); interest on the capital, twenty-five cents per thousand feet. That is all, I believe; and I base it upon works of a size sufficient to manufacture and distribute from six to eight hundred thousand feet (600,000 to 800,000 ft.) every twenty-four hours.

Q. What capital have you estimated?

A. I suppose it might be called perhaps a million. A million would build works of that capacity, I should think, in any favorable locality, with sufficient pipe to distribute that amount of gas.

Q. You have allowed interest at six per cent?

A. Yes, sir. I made that calculation in this way; that the interest on a million of dollars is one hundred and sixty-five dollars ($165.00) per day; and that seven hundred thousand (700,000) feet of gas at twenty-five cents (.25) per thousand is a hundred and seventy-five dollars ($175.00) per day, over-running the interest some ten or eleven dollars per day. I gave an estimate of one thousand feet, in order that it might be more easily comprehended.

ESTIMATE.

Cost of coal per thousand feet of gas . .	$1.25
" lime " " . .	0.05
" labor " " . .	0.20
" salaries of clerks and officers . .	0.08
" repairs	0.10
Interest on capital at 6 per cent. . .	0.25

Q. Would these gas works contain all the modern improvements?

A. Yes, sir; built upon the most approved plan.

Q. What class of retorts should you use? clay, or iron?

A. Clay.

Q. What advantage do clay retorts possess over iron ones?

A. They are more durable, and stand a greater heat.

Q. Whether or not, at the present time, clay retorts are used in the best constructed gas works?

A. I believe they are.

Q. Have you allowed in this computation for the sale of coke?

A. No; I have not.

Q. That would diminish the cost somewhat, would it not?

A. Yes, sir. Deducting for the coke thirty cents (30) on every thousand would bring the estimate down to a dollar and seventy cents, or to a dollar and sixty-eight cents ($1.68), I think. The whole estimate of the expense was about two dollars, I think. You take the whole amount of course, and it amounts to over two dollars. Deducting from that the coke and the tar, which would be (say) sixty cents (60) for the tar, and two dollars and a quarter ($2.25) for the coke, would bring it down to about a dollar and seventy cents per thousand feet.

Q. In your judgment, would it be practicable for the city of Boston, by erecting gas works at some distance outside of the city, to manufacture gas as good as we now have, at that cost for the actual cost?

A. At the present prices of every thing, it would cost that, I should think. I have not gone through any practical experiments; but that would come very near it, I think.

Q. Of what specific gravity would this gas be?

A. About four and a half.

Q. That is to say, considering air as ten?

A. Yes, sir.

Q. Whether or not, in your judgment that is a proper specific gravity for gas?

A. That is considered good quality of gas — from 4.20 to 4.50.

Q. What is your judgment in regard to the number of times and the manner in which gas should be inspected, in order to protect the consumer?

A. Well, sir, when they get into a regular system of making the thing, and the men understand their business, and the quantities of each kind of coal used are well understood, it does not require to be tested very often. They will run it very nearly equal all the time.

Q. That is to say, if they are bent upon providing good gas for the consumer?

A. That is if the quantities of the coal are understood. Sometimes the two kinds of coal are weighed, each kind, two kinds of coal being required. Where they get into the habit of measuring it with a scoop, they run it very inaccurately.

Q. For the price you mention, could you get the labor?

A. For the seven hundred thousand feet, it would be a hundred and forty dollars ($140.00) a day for the labor.

Q. Supposing the quantity of gas to exceed that, whether or not it could be made cheaper?

A. It might a very little; not much. When you get up to that quantity, you can make it about as economically as you can a million.

Q. What are the advantages of Boston for the supply of gas?

A. Only its compactness.

Q. That diminishes the leakages?

A. Well, yes.

Q. The number of miles of pipe would be smaller, would it not?

A. It has comparatively a smaller territory than almost any other city.

Q. Do you know of any other city in the United States which has equal advantages in this respect — that is, in regard to compactness?

A. I do not think of any large city which is as compact as Boston. We should have greater advantages in that respect perhaps than any other.

Q. What are the advantages of Boston in regard to the delivery of coal?

A. It has equal advantages with any other city.

Q. The sale of coke, sir, — can you give any reasons in regard to the sale of coke?

A. There is no advantage in selling coke that I know of, unless it is in price; I do not know what the price is in other cities.

Q. (by the Chairman). Does it come within the scope of your knowledge that coke comes higher in the city of Boston than it does anywhere else?

A. I do not know the fact; I never made any inquiry. I heard it said that it was sold in Charlestown for six dollars ($6.00) the other day.

Q. (by Mr. Hills). If gas works were built in the city, where should you propose to build?

A. I have not examined at all to see where the best locality is.

Q. (by the Chairman). I see you based your estimate of cost upon coal at ten and twelve dollars?

A. Yes, sir.

Q. Don't you consider that pretty high?

A. Well, the Newcastle coal will cost pretty nearly twelve dollars, and by taking two thousand (2,000) pounds of that, and two hundred and forty (240) pounds of the cannel coal which will cost some fifteen or sixteen dollars, you will bring it up to about twelve dollars. The Pictou coal, I think, costs from nine dollars to nine and a half ($9 to $9.50). If you use the same amount of Pictou coal to the cannel coal, it will cost about ten dollars. Then you perceive that if you make ten thousand feet of gas from that, it will cost about a dollar and twenty cents.

Q. (by Mr. Stackpole). Do you know at what price the Pictou coal can be bought now?

A. I see it advertised at seven dollars; I estimate it at nine.

Q. You give liberal estimates in all your calculations?

A. I think they are liberal.

Q. (by the Chairman). In estimating your coal and taking it at its money cost, the cost in gold or silver, it would be eight dollars and seventy-six cents a ton, would it not?

A. The difference is about thirty per cent I suppose.

Q. Now what would be the legitimate cost, reckoning it at gold value?

A. I am taking it as it stands to-day. It must necessarily be so if you are making gas at the present time.

Q. I suppose it is expected that we are sometime to come back to a gold basis.

A. The price, at a gold valuation, would be for the Pictou about five dollars ($5.00), and some six or seven dollars for the Newcastle.

Q. Have you any idea of the cost of gas when coal was bought at the specie value, say in 1856, or 1854, or 1850, anywhere along there?

A. Well, it might be a little more than half what it is now; per-

haps seventy-five per cent. There would not be so much difference in the labor perhaps. It cost then, with Pictou at five dollars ($5.00) and Albert at six or seven dollars ($6.00 or $7.00) to make gas in small works, every thing included, about a dollar and a half ($1.50) where they were making ten or twelve thousand feet every twenty-four hours. It is proper to mention in this connection, that I have not estimated any thing for taxes.

Q. (by Mr. Stevens). Can you tell the quality of the gas which we are now burning?

A. I should judge it to be gas that would weigh from 4.20 to 4.50 specific gravity. That would be 16 candle gas.

Q. (by Mr. Curtis). Have you taken into the estimate the waste and leakage?

A. I have not made any estimate of that. I have generally in my estimates taken the whole amount of gas consumed. There is a loss of five or ten or twenty per cent; you cannot tell what it may be.

Q. This would have to be considered in any works made by the city, would it not?

A. Yes, perhaps.

Q. This is not an estimate from actual experiment?

A. No, sir.

Q. Can you give any company that makes gas at those figures?

A. I do not know what it does cost them; I have made no inquiry; I simply take the quantity of gas from a ton of coal. It would hold very nearly; quite, perhaps. I calculated the labor at twenty cents per thousand feet of gas, which would be a hundred and forty dollars per day ($140.00). I calculated ten cents per thousand feet for repairs, which would be seventy dollars ($70.00).

Q. How much would you pay your workmen?

A. From a dollar and a half ($1.50) to two dollars ($2.00).

Q. Can you get any labor now for less than two dollars a day?

A. I think you might get men to handle the coal and do work of that character for less than two dollars. I do not know the fact; I have not asked any questions. I suppose the men inside would have to be paid two dollars. I do not know but that it is over two dollars, perhaps. But the work of forty-five benches,

of five retorts each, for a hundred and seventy dollars would be a liberal allowance for cost.

Q. (by the Chairman). Assuming that we are specie paying at the present time, how would you estimate in your calculation?

A. At about one-half, or from twenty-five to thirty per cent less; I don't think it would be quite as low as fifty.

Q. What is your idea of the decline of labor when we come to resume specie payments?

A. I should think it would make from twenty-five to thirty per cent difference.

Q. (by Mr. Stackpole). Whether or not the improvements, in the manufacture of pipes and so on, have decreased what is ordinarily called leakage in gas?

A. That depends upon the character of the manufacture and the testing of the pipes. The pipes should be thoroughly tested; they are to be thoroughly injected. After being injected, sometimes a dampness appears, and if so they rust and become tight.

Q. How low could the leakage be brought, with proper care?

A. It might be as low as ten per cent. I think that is a fair estimate; it might be less than that. The gas at the station meter would lose ten per cent. If the gas went through the station meter warm, the loss could not all be attributed to the leakage, but somewhat to the cooling down of the gas.

Q. (by the Chairman). The cooling down of the gas makes no difference in the quantity?

A. If the gas holder is exposed to the weather, and it is a little cool and cloudy, and the sun happens to come out bright, you will see the gas go up. The higher the temperature, the more the gas expands. The expansion of gas is very great.

Q. Does that make any difference to the consumer?

A. The gas measures more in the meter, occupying more space, when it is warm; but that is hardly admissible in consuming. The consumer does not experience any loss, I think, on that account, if the temperature is the same as the temperature of the earth. That varies from seven to ten degrees.

Q. The waste would then be very small if there were not too much pressure?

A. The pressure makes a great difference in the loss. The

pressure may be three inches elevation of water; then the loss from leakage would be very much greater than it would be for only one or two.

Q. Is it not proved that there is a depreciation of property where the gas holder is located?

A. It usually causes a depreciation in property, I believe, if property is valuable.

Q. Is the depreciation greater where the gas works are than where the gas holders are?

A. It would be less where the gas holders are, undoubtedly.

Q. If the land was worth two dollars a foot in the neighborhood of the gas holder previous to the gas holder being built there, what depreciation would that gas holder have upon the value of that land, after it was built?

A. It would be very difficult for me to determine that.

Q. Taking the city of Boston?

A. It would depend very much on the character of the people, I think, owning the land in the vicinity, and the character of the buildings.

Q. What would be the effect in the neighborhood of the State House?

A. I should think it would bring it down more than one half, in the immediate vicinity. It would be difficult to tell precisely what effect it would have. It would depend upon the opinion of the public, of course, altogether.

Q. (by Mr. Jewell). You know that there is a large gas holder on Charles Street?

A. Yes, sir.

Q. And don't you know that the Eye and Ear Infirmary has been built on that street? And that fine houses have been built there?

A. Yes, sir, I believe they have.

Q. You would not call that very much of a desert on Charles Street, would you?

A. No, sir.

Q. What is the most economical pressure with which to supply gas to the consumer?

A. About two inches at the works.

Q. What would it be at the burner?

A. It would be from three-quarters ($\frac{3}{4}$) of an inch, likely, to an inch; perhaps a little over that, depending on the distance from the works and the size of the pipes; that has much to do with it.

Q. Do you know what is the pressure as the gas is delivered to the consumer here?

A. I do not know, but I have heard that it was two inches and a half. I never have seen the pressure gauge that I know of. I have always calculated on my gas holders to give a pressure of two inches of water, equal to a little over an ounce.

Q. (by Mr. Curtis). Do you know of any motive that should induce the Gas Company to give too heavy a pressure?

A. I do not know of any, unless the pipes should be too small.

Q. Any such motive as that of making the consumer burn more than was needed?

A. No, sir; I should think they would lose by that. They would lose by reason of the extra leakage.

Q. (by Mr. Stackpole). If they used larger pipes, they might have less pressure?

A. Yes, sir.

Q. (by Mr. Curtis). Is not every gas company bound to provide the maximum pressure needed at the hours of greatest consumption?

A. Yes, sir.

Q. These are about two hours in every evening?

A. Yes, sir.

Q. So that they are obliged to provide a larger amount of pressure than is actually needed, to meet that?

A. Yes, sir; sufficient to cause the lights to burn properly — to a proper height.

Q. Do you know of an automatic measure to regulate the burner?

A. I have seen measures of that kind at the meter. The principal regulator, connected with the works, regulates the pressure of course to a certain extent. It is not perhaps a perfect machine. It consists of a ring and valve so ar-

ranged that when the pressure is excessive the valve is drawn to the rim, and the gas stopped in a measure from flowing into the pipe, and consequently the pressure is lessened at the pipes.

Q. (by the Chairman). If one-half of the gas pipes in the city of Boston were too small, being put down when the population was one-half what it is now, would it not be necessary to have a pressure at a loss to the consumer?

A. That condition of things might be possible.

Q. If the pipes would not supply a quantity of gas regularly to the burners, without that pressure, why, it would absolutely be necessary for them to give it, would it not? If they had a hundred lights on a second sized pipe, which ought not to supply more than fifty, they will have to supply a greater pressure, in order to give the light required, will they not?

A. The pressure at the burner might not be any greater than it would be if the pipe was larger, and the pressure less at the works. You see that at once, when they commence burning. It would be greater when the burners are first opened; but, after they were opened, the pressure might not be any greater than in the other case. If the burners were burning under a pressure of two inches, of course they could not burn quite so fully, and the gas perhaps would not be likely to burn as perfectly. Combustion would not be so perfect, as the gas is passing from the burner rapidly. But I fancy that it does not make such a great difference as some imagine in the amount of gas given. I have never experimented or tried to test the difference between the pressure of one and of two inches at the burner. It probably would make some difference if the pressure was two inches instead of one inch, in the amount consumed.

Q. If during the evening, from six to nine o'clock, the quantity of gas pressed through a pipe which would supply properly fifty burners, is pressed through to supply a hundred, is it not a loss, on the whole, to the consumer?

A. I cannot say really. I don't know that I understand your question.

Q. It is to pass the gas through a pipe which is only capable of properly supplying fifty persons, and they have to press it through the pipe to supply a hundred.

A. Well, you will perceive that when they press it through with sufficient velocity to supply a hundred, there is very little more pressure, when these lights are burning, than there would be if the pipe was larger and the pressure was less at the works. The larger pipe would have the same effect upon the burners as a greater pressure with the smaller pipes, because the pressure is taken off at the same time that the burners are taken off.

Q. If the pressure is three inches on the main pipes, does not the gas burn with greater pressure than it would with two inches?

A. Certainly.

Q. If the gas is forced on so, are there not foreign bodies forced into the room?

A. Combustion is not likely to be as perfect under a large pressure; still there might not be any perceptible escape.

Q. If we were supplied with a rich gas, made from Cannel coal, how high a pressure should it be burned at economically?

A. Well, perhaps at the works two inches would be required if the gas was driven to a great distance from the pipes.

Q. With your knowledge and experience in building gas works and in gas manufacture, would it, in your opinion, be economical and a saving to the city of Boston to build their own gas works at a distance from the city, say on Charles River or on Mystic River, and supply the citizens with gas at the minimum cost?

A. Well, really, I could not tell whether the city of Boston in that event would save any thing by it, or not.

Q. I mean the city and the citizens, — the mass of citizens.

WITNESS. Would you take into account what the city consumes?

Q. It would be giving the gas to the city and citizens at cost.

A. There would be a saving, undoubtedly. I do not know at what price the city is supplied at present. If the gas is supplied to the citizens at cost, there would undoubtedly be a saving.

Q. Fixing the price of coal at six dollars, and charging the citizens two dollars and a half ($2.50) per thousand feet, and assuming that the works cost half a million of dollars, how many

years would it take for the gas works to be paid for, charging that for eight years?

A. Taking the coal at six dollars a ton — without going into any mathematical calculation — I should think that they ought at least to make a dollar on a thousand; that the works ought to clear a dollar on the thousand, and in that case it would depend on the quantity of gas sold. The time required to pay for the gas works would depend on the amount of gas sold.

Mr. Stackpole, the counsel for the Committee, here introduced an estimate from the city of Cincinnati, and a report of the Pittsburg Gas Co., and also the Governor's message and accompanying documents relative to the city of St. Louis. Mr. Stackpole stated that a number of other persons had come forward to give their testimony, but that, in view of the determination of the Committee to close the hearing as speedily as possible, he did not deem it desirable to call other witnesses. In response to an inquiry from Mr. Stevens as to the complaints which it had been intimated were to have been brought forward, Mr. Stackpole stated that an advertisement had been inserted in the public prints for parties having complaints to attend at the City Hall at stated hours, or confer with him by letter; that he had attended at those hours, for the most part, and had examined some men; and that every thing had been put into the evidence which had come to his knowledge in regard to the matter; and also that he had put in every thing that he had heard of, which had been introduced by the Committee.

The Chairman of the Committee stated that some parties had spoken to him in regard to paying quarter's bills when they could bring positive proof that they had not used a quarter part of the amount charged; but that he had answered them that the whole thing had been tried in Court, and had resulted in a verdict against the parties who contested the bill; that if five hundred of them were to come before the Committee and enter that complaint, and go into Court with it, the result would probably be just the same as it was in that one trial. The Chairman stated that there was a party who came to him to speak in regard to his neighbor, but that his reply was that that was hearsay; also that instances had come to his notice of persons who declared that

they did not use a quarter part of the gas charged to them, but that his reply had been to them that their testimony would not amount to any thing.

Mr. Stevens remarked that the latter case was the one which was spoken of in the commencement, and that the reason that he had asked Mr. Stackpole the question, was because he had understood from the Chairman that he (the Chairman) would have those parties before the Committee.

OPENING STATEMENT OF MR. CURTIS.

Mr. Chairman and Gentlemen of the Committee, — I do not propose to occupy the time of the committee in making any extended statement, as our time is valuable, and we understand that it is the desire of the committee to close this hearing as expeditiously as possible, and moreover we have a gentleman of great experience in gas matters, here from New York, who is anxious to return at once.

I cannot permit the remarks which have just fallen from the chairman to pass without saying, as the Counsel for the Gas Company did once in Court, that we stand ready to pay $100 for a case where the gas has been charged for, which has not been used by somebody. This sort of complaint frequently arises, and upon investigation it invariably turns out, that either the clerks have burnt the gas, after their employer has gone home, in card-playing or reading, or the gas has escaped through some aperture in the fixtures, for which the gas-fitter, and not the Company, is responsible.

We stand in rather an anomalous position in regard to this hearing. All previous matters of this kind originated upon the petition, remonstrance, or complaint of a body of citizens against some proposed extension of the works, location of a new gas-holder, or other act of the Company. Then we have appeared as the respondents to meet an antagonist whose petition was hostile.

But here there is no real party plaintiff. There have been no petitions or complaints presented to the Aldermen upon which this hearing has been based. The matter seems to have started

of itself, and it places us in an apparently antagonistic position to the City of Boston; which, in fact, has no foundation. However, as our acts and doings may be misunderstood, and we may thereby receive injury, we feel obliged to appear here to meet any and all suggestions of grievance, and to prevent misconception and mistake.

Gentlemen, the subject presents itself under three heads.

First, upon its sanitary considerations. Upon this point I do not propose to offer any evidence this evening, and, indeed, I hardly think it will be necessary for us to produce any evidence at all; because, in the first place, we have heard nothing here tending to show any injury to the health of the city: and, secondly, because plenary evidence from the city physicians of former years to the contrary will be found among the city documents.

The next question is, whether the city should assume the present gas-works, or build gas-works of its own. On that point we propose to show not only that it would be the merest extravagance and folly to do so, but that it would be impossible for the city to supply gas of as good a quality, at as cheap a rate, as it is now, leaving out of the question the gas supplied to the city for the street lamps.

In regard to the position of the present works, I may say that it would be difficult to imagine a place better adapted to the economical or sanitary requirements, and the proper production of gas, than that now occupied. They are in a section of the city which seems to be naturally devoted to manufactories, and not to dwellings, with good drainage over a very short route directly into the Atlantic Ocean, not contaminating water-pipes, nor spreading itself over any flats to be exposed twice every twenty-four hours to the sun. And we do not hesitate to declare that it would be equally impossible to find a situation within or outside of the city limits, which would be any better for the citizens than the present.

The third point relates to the necessity of additional inspection; but, without occupying the time of the committee further, I will proceed at once with our testimony, and introduce Mr. Roome.

The Chairman stated, in reference to the street lamps, that it cost the city vastly more than it cost the citizens for gas.

Mr. Curtis remarked that the street lamps were not measured, but that the city were furnished with gas for the street lamps at a certain rate per hour; and that, in 1865, it cost the city less than it cost to produce the gas.

Mr. Jewell stated that by an arrangement between the Gas Company and the city of Boston, it was agreed that five-foot burners should be used on all the street lamps; and he understood that the city paid the Boston Gas Light Company one and a quarter cents per hour for the gas consumed in the street lamps, which is two dollars and a half per thousand; out of which the Gas Light Company has to pay twenty-five cents per thousand for tax; so that the city of Boston gets its gas for two dollars and a quarter per thousand for their five-foot burners. The lamps of the city cost forty-one dollars and thirty cents ($41.30) apiece, according to the last estimate.

TESTIMONY OF CHARLES ROOME.

Q. (by Mr. Jewell). Charles Roome I think your name is?

A. Yes, sir.

Q. Will you state your occupation, any office you hold, and your acquaintance with gas manufacturing?

A. I am an Engineer of gas manufacturing, and President of the Manhattan Gas Light Company of the City of New York.

Q. How long have you been engaged in the business of gas manufacturing?

A. About thirty years.

Q. How long in connection with the Manhattan Company?

A. All that time.

Q. You have gone up from your youth through all the grades of that business of that company?

A. Yes, sir, step by step, Clerk, Assistant Engineer, Engineer, and President.

Q. How long have you been President?

A. Since January, 1855.

Q. How long prior to that time were you Engineer?

A. I was appointed Engineer on the first of January, 1842.

Q. During that time have you made the production of gas a study, both scientifically and practically, and what means have you taken to develop, and otherwise to acquaint yourself with the subject?

A. I studied Engineering, and went to a Medical College and studied Chemistry. I have been to England, Scotland and Europe, and have used every means to obtain a knowledge of the business. I have employed scientific men to be my advisers, and have visited all the gas works in England, France, Scotland and Belgium, and made the acquaintance of some of the most eminent Engineers in England and Scotland.

Q. How recently have you been abroad?

A. The last time was in 1855.

Q. What is the capital of the Manhattan Company?

A. Four millions.

Q. (by the Chairman). It was stated here the other night that the Manhattan stock had been watered?

A. Every dollar has been paid in cash; there is not a single drop of water in it.

Q. (by Mr. Jewell). What do you understand by water?

A. I mean to say that every dollar's worth of that stock has been paid in by the stockholders. In New York, sometimes for $50 paid in, $100 worth of stock is issued, and the capital is sometimes double, five or six times, and more perhaps, the amount actually paid in. That we call watered stock.

Q. Will you describe the territory covered by the Manhattan Company's works and its supply pipes?

A. They extend from Grand Street to 34th Street, and from the North to the East River, about two miles each way, or four square miles.

Q. Where did you first put your works?

A. On the North River side.

Q. What difficulties did you experience?

A. We had a difficulty in supplying the east side of the town; for New York is higher in the middle than on the river, and in overcoming the difference in elevation, we had a difficulty in giving a sufficient supply to our gasometers on the eastern shore.

Q. How did you remedy that difficulty?

A. By building the works on the East River side.

Q. How are your works situated on the river compared to your territory?

A. They are very nearly opposite.

Q. And nearly central in position?

A. Yes, sir; one is at the foot of 14th Street and the other at the foot of 18th Street, on the East River.

Q. Your supply, then, is very compact?

A. Yes, sir.

Q. As compact as Boston?

A. I should think so. It is at right-angles, except one street, and that is Broadway.

Q. And what is your yearly production of gas?

A. We made last year 1,046,000,000. We have had this year up to the end of November, 1,048,000,000. We are sending out now about five million feet a night.

Q. You are making, then, from one and one half to three times the production of Boston?

A. Nearly three times, I should say.

Q. What did you state was the production of the city of Boston?

A. About 1,800,000 feet a night. The annual production is 370,000,000, to 400,000,000. There is a slight advance of cheaper production as the production increases.

Q. So that the Manhattan Company would be able to produce somewhat cheaper than the Boston Company by reason of the increased production?

A. Probably somewhat. The general expense of management would not be much decreased.

Q. Has your company ever been able to pay a dividend?

A. We paid five per cent last January, five per cent in July, 1865, and we paid a dividend in April, 1864. We have paid but two dividends since April, 1864. We have not paid from the beginning up to this time six per cent on the capital actually paid in. I don't mean six per cent on four millions, but on our actual capital at different times. Our capital was started at $500,000 and when I took charge of it, $320,000 had been paid in, then we got the Legislature to increase to 800,000, and then to a million and then to two and four millions.

Q. What does the Manhattan stock sell for in the market?

A. I don't know, sir. My business is in Irving Place, not in Wall Street. I never paid any attention to the market value. It has

sold as low as 120 but what it is selling for now I don't know and have not heard lately.

Q. (by the Chairman). Was there ever any sold?

A. Occasionally some.

Q. Do you recollect what it brought in 1863, 1864, 1865 and 1866?

A. No, sir. It is very seldom offered in the market. It is not a fluctuating stock, and gives little room for speculators.

Q. (by Mr. Jewell). Will you state to the committee the cause why you have not been able to make a profit during the last year, and give the elements out of which you get it?

A. The cost of many things was not the same in '65 that they are this year. The cost of coal was 93 cents and $\frac{84}{100}$ per thousand feet. The cost of labor 33 cents and $\frac{22}{100}$ per thousand feet. That includes simply the retort labor, or the men actually employed in and about the works, in the retort house, and engaged in making the gas. The cost of repairs of the apparatus, keeping it in order, was 16 cents and $\frac{45}{100}$. The lime cost 3 cents and $\frac{48}{100}$ which would make 146 and $\frac{89}{100}$. Our loss by leakage, condensation, and gas unaccounted for, amounted to 16 cents and $\frac{17}{100}$ which would make the gas cost as it leaves the works (not taking into account the salaries of any officer, or any cost for the management of the business, interest on the capital, taxes, or any other expense whatever except the first cost of the gas as delivered to the consumer) 163 cents and $\frac{16}{100}$ per 1,000 feet.

Q. At that cost of production, the station meters selling at $2.75 per thousand have you been able to earn a dividend?

A. We have not. We have got $2.50 and we are permitted to add the Government tax which is twenty-five cents against last year thirty.

Q. You charged thirty cents on the bills?

A. Yes, sir.

Q. The additional expenses which are properly chargeable to the business are so great that you were unable to make any dividends?

A. Unable to in the past, and will not make any in January ensuing. We have not made any since January, 1866.

Q. What class of coals do you use?

A. The coals are from the British Provinces and from Pennsylvania.

Q. What kind of coals had you?

A. We had 70,000 tons of Cape Breton coal, and we had 10,000 tons of Lingan, and we had some other coals. We use very little cannel. We only use it for what Engineers call the "brandy bottle" to strengthen the gas which is apt to get weak, and make a uniform light, but we only throw in Cannel when we cannot avoid it.

Q. Do you use any Albert coal?

A. Not a particle have we used for years.

Q. Will you state the cost of your coals the last year?

A. As nearly as I can calculate it was $10.17 a ton, for a ton of 2,240 pounds.

Q. Does that include the expense of wharfage?

A. Yes, sir.

Q. Do you know from information what the cost of the Boston Gas Light Company's coals were for the same period?

A. I don't know only as I was told. I was in their office to-day and looked over some of their books, and was told that the cost of theirs was $11.40 including the expense of wharfage.

Q. That makes $1.30 in your favor?

A. Yes, sir.

Q. That price of the Boston coal was obtained by giving an average of the Pictou and Albert?

A. Yes, sir. Their coal was Albert, Newcastle and Pictou.

Q. Will you state the particulars of your manufacture, that is to say, whether you use clay retorts?

A. Altogether.

Q. What time of charge do you give your coals?

A. Five hours.

Q. State whether your manufacture has undergone any change within the last three or four years and if so, what causes have led you to make the change?

A. We used to make the gas of about one-third Cannel. We used to use one-quarter Cannel in hot weather, one-third in spring and fall, and in extremely cold weather about one-half Cannel. Our charter limits our price. We are compelled to sell at $2.50 per thousand feet. We went to the Legislature two years ago, and by a unanimous vote they removed that restriction, or passed a bill to that effect, and Governor Fenton vetoed it after the adjournment of the Legislature. I then went to Congress and asked that we might be permitted to add the tax to our bills, or

that we would be compelled to close our works and give up our charter. They granted permission in the Senate. In the House it was rejected and a Committee of Conference was appointed, and they agreed to allow us to add the tax until the 30th day of April next, to give us an opportunity to make another appeal to the Legislature of the State of New York. That appeal we intend to make as soon as the Legislature meets. If we fail we mean to give up our charter. By a law the city of New York compels us to supply everybody who shall demand gas, and shall pay for the same, under a forfeit of $10 for the first day we refuse and five dollars for each succeeding day, and as we have not received within $300,000 a year what it will cost us to produce the gas, we will make an appeal to the public, and if we can find no redress, we shall have to find some other means of making money. We cannot live on $2.50 and pay the Government tax. We cannot make the Cannel coal gas, and sell it at $2.50. We cannot pay expenses at that rate, and furnish such gas as we did before this rebellion broke out.

Q. What changes have you made in the character of your gas, to meet the increased expenses?

A. We have given up the use of the more expensive material. We have also charged our consumers rent for meters. We gave that up a few years ago, but necessity has compelled us to resort to it again.

Q. And with that change are you not able to make a dividend?

A. No, sir, I think on the last six months our receipts gave us less than $1.00 profit per share.

Q. What is the material you are using now?

A. We are using coal from the Provinces with the exception that we don't use Cannel.

Q. Have you reduced the grade of your gas?

A. Unquestionably.

Q. To what extent?

A. Our gas was as good as yours, but now I think we run along in the summer about sixteen candles, and it may be that in a good pleasant day now, but in a cold day we run down to thirteen or fourteen.

The CHAIRMAN. You call it a poor gas?

A. No, sir. A good gas but it is inferior to our former production.

Q. As to whether you run your retorts so as to obtain a greater product than you formerly did?

A. Yes, sir. We work under greater heat and get more gas from the coal than we formerly did.

Q. Can you state how much you produce per ton in feet?

A. Over 9,800 feet.

Q. That is, you run your coal to such an extent that you produce over 9,800 feet?

A. I think I have got our average here. From 106,000 tons of coal we produced 1,896 feet to the ton more than before.

Q. Beyond what you would produce by the old scale of manufacturing?

A. I think so. It would probably run off 9,500 feet.

Q. Did that greater heat deteriorate the quality of the coal?

A. Of course. There is however a difference in the coals. Some coals require to be worked higher than others. There are some coals that will not give off their gas at a low temperature, and there are others which it would be a serious injury to work at a high temperature, therefore it requires judgment on the part of the manufacturer.

Q. And you use no Cannel or Albert coals because you cannot afford to use them?

A. Yes, sir. We have used some Cannel but not a great deal.

Q. Have you ever examined the Boston Gas Works?

A. I was in there to-day, and have not been there before for some time. I used to be in there many years ago.

Q. Will you describe the condition of the Boston Gas Works, as to efficiency?

A. I should judge them to be very efficient. I should judge they had every means to produce gas, and present it as pure to the people of the city of Boston, as any works that I have ever been in.

Q. Are there any improvements that you would make in their works?

A. No. I would if I had any change to make, take advantage of a clear space of ground. These works have been added to as their business increased. We had the same serious difficulties on the North River side, and when we built the works on 14th Street side, we remodelled our whole works. Just so here in Boston. I would lay them out so that I could have more convenience, although I could not make them more efficient.

Q. Did you examine the apparatus for purification?

A. I did, sir, and tested the gas while I was there.

Q. Did you test it hot?

A. I never knew that to be done.

Q. You found it pure?

A. Very pure. I tested with sugar of lead, and if there had been any impurity in a hundred feet of the gas, I should have detected it instantly.

Q. Did you observe, or was it shown to you, the character of the coals then used?

A. Yes, sir.

Q. Will you state what you found it to be?

A. Like all Pictou coal.

Q. What was the proportion of Albert coal?

A. I think about eight or ten per cent. I saw Albert coal, I have used it and know what it is.

Q. What is the quality of the Boston gas, judging as well as you are able?

A. I believe it to be very superior gas. I don't believe there is any better gas made in the United States from what I know of the gas made elsewhere. It certainly is better than any gas made in the city of New York.

Q. Are you familiar with the Brooklyn and Williamsburg gas works?

A. They are pretty much the same. I don't know whether, or not, they use much Cannel. They use a little.

Q. And your company don't use Cannel?

A. Not much, sir.

Q. Do none of the New York Companies to your knowledge use more Cannel coal than you do?

A. The Harlem don't use any I think, because the President told me so the other day. The Metropolitan occasionally if it is a very cold day, use a little, but they will not use it as a settled thing.

Q. Has the Boston gas as high an illuminating power as it is economical to manufacture for use?

A. Experience has shown that that gas pleases the people best which will burn the freest in a good sized burner, and with the least smoke. In Liverpool, where they make the best gas made in England, the public are not as well satisfied, as they have been with the gas made in other cities, and Americans have asked me why it was that they could not get as good gas in Liverpool, as they furnished in New York, and I told them their gas was richer

than ours, and possessed a higher illuminating power, but the gas must be consumed in a burner peculiar to itself. If it was used in such burners as they use in New York, the gas would smoke, and it is almost impossible to get a good gas burner. Over twenty candle gas will smoke, and when it smokes, the consumer will not believe it is on account of its richness, but think it is on account of its impurity. If you take an oil lamp and put in the purest oil that is made, and put the wick up too high, the lamp will smoke, for it is that smoke which really gives the light when properly consumed. It is contended by engineers (and is a disputed point) that a large flame of less intensity, having more points to radiate from, will distribute more light than a small flame of an intensity which is greater than the large flame, because the small flame has fewer points to radiate from. That is a question that has been mooted, and upon which there is a great deal of argument; but it is the opinion of Mr. Merrick, of Philadelphia, (and he is a man of experience — he built the Philadelphia works) that in England, those towns which make the poorest gas, are the best lighted.

Q. It has been said here by a witness, that in his judgment, a seventeen candle gas was the most satisfactory gas for the community.

A. My experience coincides with his. I think gas from sixteen to eighteen candles will give more satisfaction than gas of higher illuminating power. I have found it so in an experience of thirty years' observation.

Q. The Boston Gas Company use iron retorts?

A. They do, sir.

Q. Did you observe any nuisance about the works?

A. I saw nothing there that could be considered a nuisance any more than you could consider an iron foundry a nuisance, or any place where there are large fires. I don't see how you could imagine any thing about those works a nuisance.

Q. Have you ever been in gas manufactories of similar size, where there were less objectionable smells than here?

A. I have been accustomed to those smells all my life, and they are not disagreeable to me. I don't see any thing in them objectionable. I don't see how they could be less objectionable.

Q. As a matter of fact, are there any objections to gas works on sanitary grounds?

A. None that I can imagine, if properly conducted.

Q. Experience has shown, has it not, that the state of health of the operatives, or those who live in the vicinity of gas works, is no lower than among other citizens?

A. I think the state of health is higher.

Q. As a matter of fact, there has been no cholera in the vicinity of gas works?

A. We had no men about our works attacked. I saw a statement in an English paper that in Marseilles or Barcelona they were remarkably exempt from it, and in one place the men used to bring their wives to sleep in the works at night. Carbolic acid is said to be very beneficial. Men who work over artificial fires seldom are subject to any epidemic that comes along. The intense heat seems to keep their pores open, causes them to perspire freely, and the heat seems to purify their blood.

Q. Considerable discussion has been had before the committee with regard to clay and iron retorts. You use clay retorts. Will you state what their advantages are?

A. They are more durable and I think they are more economical. If I did not think so, I would not use them. I don't believe it makes one particle of difference whether the gas is made in an iron vessel or a clay vessel. I can't see how the material in which the coal is distilled can in any way affect the quality of the gas. It is a question of economy, I think.

Q. Can you state what the elements are that enter into that opinion?

A. Clay retorts cost less than iron retorts. They last longer. It may be that clay requires more fuel than an iron retort, and then the question arises which it is of the most importance to preserve, the iron or the fuel.

Q. You think that if your fuel is of high cost, you prefer iron?

A. Yes, sir. We have 900 retorts in one of our works, and between nine and ten hundred in the other. We are constantly tearing down and building up. The clay retorts last two years, twice as long as iron.

Q. Will they stand a much greater heat?

A. We can get iron retorts just as hot as you please to make them, but the heat does not remain the same. The more you charge them, the more coal you put in, the more fire you must put in. I have had some iron retorts heated so as to melt them.

Q. Then your use of iron retorts would be when you wanted to use a high degree of heat in order to carbonize the coal?

A. If I put as much heat on iron retorts as I do on clay retorts I would burn them up.

Q. You saw the Boston Gas Company's retorts in operation to-day — state what was their condition.

A. They appeared to me to be in very superior order. I saw some of the retorts opened, and there appeared to be no leaks.

Q. Do they produce gas at a moderate heat?

A. They produce gas at a much less heat than I do. Their retorts were not as hot as our retorts.

Q. That was in consequence of their using coals which don't require so high a heat to carbonize them?

A. I presume so.

Q. As to the use of iron and clay retorts? That is still a mooted question among gas engineers?

A. Yes, sir; but I think clay is coming into more general use.

Q. What was the object of the New York Company in using clay retorts?

A. Some time ago they said they liked iron best, but lately they have used the clay, and the President, whom I saw the other day, told me he was not positive which he liked best.

Q. He uses a large number of both?

A. Yes, sir, but I don't know how many clay retorts he uses.

Q. Did you know about their using clay retorts in Philadelphia, and giving the other kind up?

A. I understood they did some time ago, but I don't know whether they now use any iron retorts or not.

Q. The quality and price of coke used in the fires would be an important element in the use of clay or iron retorts?

A. Yes, sir.

Q. A company whose foreman, mechanics and laborers were all accustomed to the use of iron retorts, would make a rather hazardous experiment if they undertook to change suddenly from iron to clay?

A. I should say it would be very injurious and unwise.

Q. In the production of gas as to purity and quantity you said there was no difference?

A. I can't see any difference.

Q. I think you said you judged of the candle-power of the Boston gas from your eye?

A. I did not test it, but judged from the material used that it must be eighteen or twenty candle power. I should say so

generally, by judging with the naked eye. It is not competent for any man to judge of the illuminating power of gas by simply looking at it with the naked eye. It is a very nice thing for a person to test gas to a shade with the naked eye.

(By Mr. Stevens.) It is a fair quality of gas at sixteen candle power?

A. No doubt of it. It is a beautiful gas, good enough for anybody on the face of the earth.

Q. Do you believe you could form a correct opinion of the candle power of this gas in this room by looking at it with the naked eye?

A. I never have been accustomed to judging in that way. I judge by applying my photometer if I want to know. I take a burner, and then can form some sort of a judgment. But I should not want to express an opinion by looking at gas through a ground shade. A good deal might depend on the shades, but I can see enough of it to satisfy my own mind that it is a very beautiful gas.

Q. From your experience as a gas manufacturer, state whether, in your opinion, at the prices which have ruled for the last two years, the Boston Gas Company can make and sell gas as good as you have observed and such as they make from the coals you have seen, at a less price than 3¼ cents, they paying the taxes?

A. I think it is a very beautiful light, and I think that those who burn it ought to be contented.

Q. How large a dividend should a Company made.

A. I think a manufacturing company ought to make ten per cent a year or twelve per cent. We can put our money in Governments, and run no risk and pay no taxes, and get seven per cent. I had rather put my money in Governments than any thing I know of. I had rather get seven per cent on bond and mortgage than have my money in gas stock. Gold is very uncertain; but there is no doubt about the security of Government.

Q. What are the prices charged for gas in the city of New York?

A. The New York Gas Light Company charge $3.50 per thousand feet, they paying Government taxes. The Metropolitan Gas Light Company charge $3.50, and they pay the Government taxes. The Harlem Company charge $4.00 per thousand feet, and they pay the Government taxes.

Q. What is the production of these three companies as compared with your own?

A. The New York Company make about one half; the Metropolitan, one fifth what we do. We don't make five times as much, but between four and five times. I don't know what the Harlem make.

Q. Do you know the price of Brooklyn gas?

A. I believe the Brooklyn Company charge $3.25 and they pay the taxes. Of the Citizens' Company I am not certain about, but I think they charge $3.75. The Williamsburg I am not positive about; but I think their agent told me they charge $4.00 per thousand and add the Government taxes to that.

Q. None of these companies use Cannel coal except as you have stated?

A. Except as I have stated. I don't know whether the old Brooklyn Company use Cannel coal or not.

Q. I think you have stated there was no gas in the City of New York that was equal to this gas in your estimation?

A. No, sir.

Q. The restriction in your charter does not apply to any other Company in the State?

A. I believe we are the only company restricted in the United States unless it is the company in Washington — and if so, it is the only one besides ourselves.

Q. You think that at $3.00 net we cannot any more than make a fair profit if you cannot live at $2.50?

A. I cannot see how it is possible. We cannot pay dividends and I don't see how you can.

Q. Take the question of street lamps. Our street lamps are graduated at five feet to the hour. What is the fact in regard to the consumption by the burners? Does it not run over the regulation amount?

A. Our old contract which was in existence between us and the city required that we should furnish three feet an hour. I had about one hundred taken down and proved, and they averaged three and eight-tenths.

Q. Is three feet the scale in New York?

A. Yes, sir.

Q. At the same rate of increase, our five feet burners would burn towards six feet?

A. Very likely.

Q. Then, if your burners are designed to furnish five feet of gas, you will probably deliver six?

A. Yes, sir.

Q. In your opinion, the Boston Gas Light Company selling at $2.25 net, makes a loss on the street lamps?

A. I should suppose that burners set at five feet, might throw off six feet. I don't know what it costs them here to make gas, and I don't know what they pay for lighting and putting up.

Q. There could be no profit on gas at that price?

A. I don't see how it could be possible.

Q. What are the peculiarities of Cape Breton coals?

A. They make, some of them, a good deal of gas. They make gas of a very superior quality; but they are very difficult coals to store in large quantities. They contain a great deal of sulphur. Last winter our men suffered so much — in the purifying house — that the blood run from out their eyes and ears, and now we cannot purify this enough.

Q. The danger is from spontaneous combustion?

A. Yes, sir.

Q. And that, where you are able to get other coals, is a sufficient reason for excluding them?

A. Yes, sir. I would not use them if I was not compelled to.

Q. Do fires occur frequently?

A. Yes, sir. We have had two or three fires. I suppose we had one fire which it took us three weeks to put out.

Q. You get a larger amount of gas from them?

A. Yes, sir. It makes much more gas than Newcastle.

Q. But it would be much more offensive to the neighborhood in which it was manufactured?

A. I can't say that. Because no good gas-maker would allow it to annoy a neighborhood. We had better health after we had established our gas works than we had before they were erected.

Q. It don't affect the consumer at all, because the sulphuretted hydrogen is taken out?

A. We don't allow our gas to go into the streets in case any sulphuretted hydrogen is in it. No good gas-maker will allow that to go into the street.

Q. What is the price of the street lamps in New York?

A. We have a suit with the city. Our contract made in 1848 for twenty years, to burn part of the year, limits the city to burn under the contract during twenty-three hundred hours in the

year, three feet an hour for $15.00; and the corporation should have a right to increase the number of hours and should pay pro rata, according to that increased number of hours, at the rate of $15.00 for twenty-three hundred hours. When the Crystal Palace was built, they felt disposed to order us to light the lamps every day in the year, and it has so continued, lighting at about dark. They burn thirty-eight hundred and thirty-three hours and twenty minutes, which brings it to exactly $25.00 a year. Two years ago we petitioned the Common Council, setting forth that our price had been fixed on a specie basis, and asked them if they would not grant us relief. They passed a resolution annulling the contract, and giving us ten days to consider whether we would annul the contract and enter into a new one, on the understanding that we were to receive $53.00 per year. The Comptroller refused to be present at the opening of the contract, and we commenced a suit against the city. They have paid us $300.000 on account — we stipulating that the suit should go on without prejudice to either party.

Q. Do you know what they pay the Metropolitan Company?

A. Part of their district they have not paid for. The other part they have paid for at the rate of $53.00. The Harlem have also received $53.00. The New York I don't recollect about, but I think $53.00 — and this includes the lighting and all. The Harlem sued and recovered judgment. They carried their case up to the Court of Appeals, and the Court of Appeals decided in their favor.

Q. Does this $25.00 pay for the cost of lighting?

A. It is intended to pay the cost of lighting and putting out.

Q. Will you state to the Committee what elements are to be taken into consideration in selecting a location for gas works?

A. They should be placed nearly at tide-water, where there is sufficient water to float the vessels that bring the coal, and where there would be ample drainage into a running stream. They should be placed on lower ground for the purpose of convenient distribution.

Q. Take another element?

A. The ground ought to be solid. It ought to be good earth. So that, it would save expense in building tanks for your gas holders, and also that your retorts and apparatus may have a firmer foundation.

Q. Would the question of getting rid of your waste water be an element to be taken into consideration?

A. It would be very important. There is a great deal of water used in washing gas, and as that water washes away it must be got rid of. There is more or less oil in the matter which floats on the stream. I don't know that it would be very detrimental to health, but it would make the people think it was, and it would cause unnecessary dissatisfaction.

Q. As to the works being near the consumers, state whether or not that would be an element.

A. The nearer the works are to where the point of distribution commences, the less you will have to expend for your main artery or the pipes of distribution.

Q. Will you explain a little more fully to the committee the importance of having your works close to deep water?

A. If your works are close to deep water, your coal can be discharged almost directly into your coal stores. If your works are away from deep water, the cost of cartage will be very considerable. The first Williamsburg Works were considerably inland, and as they proposed to increase their works they sold out the old property and bought new land along the river and built new works. So in Washington. They first had their works inland, but upon enlarging them they moved to the Potomac River. It is a great saving of expense. Coal is a bulky article, and costs a greal deal for cartage back and forth.

Q. With regard to English coals?

A. You ought to have vessels that will carry from 1,000 to 1,200 tons, and land their cargoes at your wharves. In New York, the Cannel is brought in what we call "dunnage" or ballast. Dunnage is merchandise that is laid on the bottom of the vessel to make a foundation for nice goods so that they will not get wet. Sometimes that comes to the city, but we would always prefer to give sixty or seventy cents more to have a vessel come loaded full and come directly to the works. It is more convenient to discharge. It can be done so much more rapidly.

Q. In this particular, how do you say the Boston Gas Works are situated?

A. I should judge very admirably. I should judge they have 18 or 20 feet of water, and these vessels can come directly to the dock.

Q. To establish works up Charles River or up Mystic River,

where the draft of water would not permit these foreign vessels to go, — would it not be a practical exclusion of that class of coals from use?

A. We would have to bargain with them to deliver their coal into lighters, and take it up to the wharves.

Q. Will you explain the necessity of having gas on low ground?

A. The gas goes up hill much faster than it does down. The gas works have to have less pressure, and it is the object of Gas Companies to have the least possible pressure.

Q. Have you had any difficulties in New York growing out of the fact that your works were not built on solid ground?

A. Yes, sir, a great deal of trouble. It has been very expensive. The consent of the city required that our works should be placed on the margin of the river, and we have built them there on made ground. I filled 750 feet while I was Engineer on the North River, and we purchased the whole ground except the made ground. We were obliged to drive piles under the tanks that hold the gas, and this was very expensive. There will be more or less trouble, and in one of them a few years ago we had a whole retort house fall down. It had stood for ten years, and we considered it safe, but one night it fell down. It is very expensive to drive piles, particularly now.

Q. Will you explain somewhat more fully the necessity and advantages of having the location of the works near the points of consumption?

A. You have got to start at some point to distribute. You have got to reach that point from the place where your gas is made. And the farther the works are off, the larger of course must be the main pipe of supply. Again, if that pipe is not going through solid ground all the way, there is likely to be a disturbance. We can get along if you are willing to go to the expense; but you will be so much farther off from your customers, and in case of trouble you cannot ascertain it so readily, to provide a remedy. The more main you have, the more leakage or the less gas you have; and if you have a long main supply, then any accident by which your main is broken would leave the city in darkness, and we can imagine the effect that would have in your city of Boston. In New York it would lead to riot and bloodshed beyond question. There was an attempt in 1863 to destroy our works. That was the first thing government cut off. They sent us troops to protect them. I had my regiment of militia out for a week guarding the works.

Q. As to the question of pressure in regard to the delivery of gas, how does it depend on the distance, and how does the distance affect the pressure?

A. The pressure grows less and less from the point at which you start, and would depend on the size and distance of the pipe. There are certain rules for calculating that. The pressure will vary according to the square root of the length, and directly as to its specific gravity.

Q. The danger of loss by leakage would be greater as the length of pipe was greater?

A. It is absolutely impossible to make gas pipe absolutely tight. All experience goes to show that gas goes more or less directly through cast iron. Then, again, the temperature varies; and these pipes are contracted and expanded, and the joints get started more or less. The building of sewers or putting in of drains, and any thing which causes a disturbance of the ground, will disturb the pipes, and thus affect the question of leakage.

Q. Suppose pressure enough to drive gas through a pipe five miles long: would it have any effect on the meters?

A. If you were to send gas through pipes five miles long, the effect on the water meter would be to force the water over and put the gas out.

Q. The situation of the Boston Gas Works is as good as your own for the purpose of distribution, is it not?

A. I should judge so.

Q. Are there any difficulties in connection with the unevenness of the hills of Boston which would make engineering the works more difficult than on level ground?

A. Unquestionably.

Q. You are aware that the Boston Gas Light Company makes use of Station Gas Holders into which the gas is sent after being manufactured before distribution? State whether that is a useful way of obtaining an equal low pressure?

A. I think so. I think the principle is right. I would prefer to have my gas holders as near the works as possible so as to have them under my control. Here that cannot be done. Here in low places I would put gas holders, and I could thus keep the pressure much more uniform than it would otherwise be. We find a difference in the pressure of from three-fourths to one and one-half inches between the gas works and our office.

Q. Your having two works relieve you from the necessity of having gas holders?

A. Yes, sir.

Q. State the greatest distance your works are from your point of supply.

A. About one mile. In the daytime one of the works will take the day pressure and supply during the day very well, but towards evening both of the works have to be opened fully.

Q. Can you give an approximate estimate of the cost of erecting gas works sufficient for the purpose of supplying the City of Boston with gas, making an allowance for increase in size for future consumption?

A. That would take me some time. I can't do it in one day or two days. I suppose it would cost, taking buildings, pipe, etc., into account, twice what it would before the rebellion broke out.

Q. Our capital stock is $1,250,000. State whether in your judgment the Boston Gas Works could be produced where they are to-day for double that sum?

A. As I stated to you before, I cannot calculate what the cost of such works would be; but if this money was expended by men of judgment it would cost twice that now. That is, it would cost $2,500,000 now.

Q. Can you give the Committee an idea of what the additional cost would be of running a main sufficient to supply the city of Boston (assuming that we burn two million feet now) from the distance of four or five miles, assuming the ground to be favorable on which you were to lay the main?

A. I should hardly like to estimate the cost, because I don't know how to get at the price of the materials. The iron would probably cost not less than five cents a pound; but I don't know enough about it, to calculate the entire cost. I should judge that in going five miles there ought to be one main four feet in diameter, which would cost several hundred thousand dollars.

Q. Have you any idea how large they are in London?

A. They are of all sizes and sorts. I don't know exactly. The chartered company have several lines of mains running out from their works. They don't supply all their districts from one main that leaves their works. They have different stations.

Q. By stations you mean gas manufactories?

A. Yes, sir.

Q. That is where gas is made and where it is distributed?

A. Yes, sir.

Q. How many are there?

A. I think three or four.

Q. Do you know that those works distribute through mains more than six miles long?

A. I don't. I never heard of such a thing.

Q. When were you in London?

A. It was in 1855. There was no such distance from the point of distribution then.

Q. Have any works been built in London since 1855 to your knowledge?

A. Not that I know of. I am not certain.

Q. If it was proposed to build gas works and bring the main pipes across Charles River, what engineering difficulties would you apprehend there?

A. I don't know. I should not want that job to do. In the first place, I should want a dam across the river. You cannot lay gas pipes like a telegraph cable, because the pipe must have a regular descent to some point of condensation — for you must understand that it almost always rains inside a gas holder. The water is constantly evaporating from the surface, and as it evaporates and condenses, this holder is constantly rising and falling. The gas holder will go up sometimes two or three feet a day — lower and sink again at night. This moisture, which is constantly rising from the water, goes along with the gas, and then your gas main is nothing more or less than one immense condenser. It may be five miles, or it may be eighty miles. Now this condensation must be got rid of, otherwise it increases until it finally fills the pipe. You notice sometimes the water jumping in the pipe. It keeps on increasing until finally the pipe is full. You must have that pipe descend to some point. If you are going to have a pipe cross a stream — a large stream like that — it can be done only at an enormous expenditure of money. It must be tunnelled. Charles River might be tunnelled, but how any man would lay that main and guarantee how he was going to keep that gas steady, I don't see. I don't think any reasonable man would say that it was practicable.

Q. The expense would be enormous?

A. It must be.

Q. The exposure to leakage or accident would be what?

A. If a vessel should drag its anchor, and break the pipe, then

your city is in darkness. If you are going to cross streams where there is going to be interruption, it is most fearful.

In Philadelphia the gas is carried a long distance. I don't know how large or how long their pipes are. They have works at the foot of Market Street, and then they have other works, so that the city does not depend on one set of works altogether. The works might be interrupted and the city still be partially lighted.

Q. What do you think of the objections to having gas works in the city on the score of health?

A. Nobody objects on the score of health. Our own neighborhood is growing up very fast since the erection of the gas works.

Q. Have you any inspection by law in the State of New York?

A. No, sir. The constitution of New York forbids it. According to the constitution of the State of New York, "all laws for weight and inspection of any article of merchandise are hereby repealed, and no such office shall hereafter be created by law;" and then comes another clause, "and it shall not be construed so as to prevent securing to the people correct weights and measures, and the establishment of an office for that purpose." Under that law, it was held that an Inspector of Gas-meters might be appointed, but that it would not cover the appointment of an Inspector for the gas itself.

Q. Can you tell out of what evil that law grew?

A. We had a great deal of trouble about the operation of the old inspection laws. I don't know how it is in Boston, but we think *our* city officials are very corrupt.

Q. (by the chairman). Do you have any Inspector of Milk in New York?

A. No, sir. The law forbids the appointment of any such officers.

Q. Have you no Inspector of Tobacco?

A. No, sir.

Q. How does a man make a purchase in New York of a hundred hogsheads of tobacco without an inspection?

A. I don't know, sir. All the inspection laws are abolished. Some of the brands of pork and beef give a character to the article which answers the same purpose as an inspection.

Q. (by Mr. Jewell). We have an inspection law here. By it our gases are required to be tested under the burner and under the pressure best adapted to produce their effect. Will you state whether or not this is just?

A. I should say so, sir.

Q. Will you state why ?

A. The English law is adapted to try gases made from what are called caking coals, that is, coals similar to Newcastle, Pictou, and Pennsylvania coals. Our coals that burn in a grate would partially melt. For such gases, we always use as a standard burner the fifteen-hole argand. If you take rich gases, such as twenty, twenty-five, and up to thirty candles, you cannot burn those gases to advantage in that burner. There is a long series of experiments published in the Journal of Gas Lighting, by Mr. Alfred King, by which he showed clearly that the fish-tail burner gave better results with the same quantity of gas than he could get from any other burner. You ask me, perhaps, the reason why this is so. Gas is a mixture of hydrogen and carbon, chemically united. There are other substances in gas, various compounds of carbon and hydrogen, but carburetted hydrogen is the main thing. It is this carbon which is heated white-hot, that gives the light. The moment the gas mingles with the air, by applying the flame, decomposition of the gas takes place. Hydrogen uniting with oxygen forms water. The carbon uniting with oxygen forms carbonic oxide and carbonic acid. The more carbon this contains, the more light that gas will give. The more carbon it contains, the more oxygen it requires. If the gas is thin, that is, when the gas has less illuminating power than it requires, it will be so immediately consumed that the carbon will not be suspended a sufficient length of time in the flame. The heat of hydrogen and oxygen united heats the carbon in the flame, and the carbon and oxygen united increase the heat still more. Therefore in an argand burner, where there are a number of jets coming out, these jets, touching each other, form an almost solid circular flame, and the burner is so constructed that the amount of air which comes through the centre of the angular space and the body of the flame and the enclosed chimney, is just about sufficient to decompose that gas at such a rate as to hold the carbon suspended as long as possible. If there is not sufficient air the gas will smoke. If there is too much air the gas will burn more or less blue flame, and with less light than it should produce if the burner were properly constructed. If the air gets in your pipes for instance, and the light burns with a little blue flame, it is because the gas is already mixed with air, and the union between the gas and the air is so rapid that the carbon is not sufficiently suspended. The

fish-tail burner, which is a burner with two small holes drilled in the end crossing each other, throws out a little flame, coming out only so far that the amount of atmospheric air will just be sufficient for the proper combustion of that burner. Then the less pressure under which the gas is consumed, the more light it gives out in burning, but only for the simple reason that these particles of carbon are lampblack or charcoal, which are solid, and are held suspended white-hot in the air, and it is this white-hot carbon that gives the light. Mr. King's experiments show that the fish-tail burner is the best burner for a very rich gas. The argand burner is the best burner for such gas as is used in London, — the Newcastle, and similar gases.

Q. Then it would be very unjust for any thin burning gas to be tested by a fish-tail, or for a rich gas to be tested by an argand burner?

A. Yes, sir.

Q. (by the chairman). We use argand burners very extensively in this city: could we do it if we had very rich gas?

A. You have very beautiful gas, and yet you do use them.

Q. You go up to 24 or 25 candle gas and it is not as good a burner?

A. No, sir. Where cannel gas is made they use several small burners together. One foot, two feet, or three feet. In Liverpool they sometimes have them in clusters, — five in a cluster, and consuming one foot or a foot and a half per hour.

Q. (by Mr. Jewell). Would you think it a wise measure to allow an inspector of gas to recommend a particular quality of burner? Would not such an officer be subject to such temptations as you alluded to in New York?

A. Suppose an inspector of meters should recommend any particular meter, the public would want that gas meter because he said so. He might be an excellent inspector of meters, but not a maker, and not competent to judge whether that meter was better than any other meter. It would cause jealousy and might place the companies at the mercy of some particular manufacturer. With regard to the burners I don't see any objections. If I was an inspector of gas, I would say to a man who asked me what I thought the best burner, — I might say, "I like this burner very well, but I don't think it would be proper for me to put it out to the public, and say you had better use this burner or that burner,

because I think I would very soon receive fees for my saying so." I think if anybody should come to the inspector, and ask him to recommend any particular man's burner, he would do it.

Q. Do you know the cost of coal in Pittsburg?

A. I do not.

Mr. Jewell read from a paper a statement that the cost of coal in Pittsburg is nine cents per bushel, and coke sells at the wharves for five cents per bushel.

Q. Do you wonder that at these prices gas can be made there at ninety cents per thousand?

A. I do not.

Q. Do you know any mechanical contrivance which can regulate the pressure of gas so that the city of Boston can dispense with receivers or gas holders in various parts of the city?

A. I do not.

Q. Do you mean to say that you could lay pipes five miles, and keep the pressure uniform?

A. No, sir.

Q. Are you familiar with an instrument called the governor?

A. Yes, sir.

Q. Would such an instrument accomplish that end?

A. No, sir.

Q. If you were going to construct new works in New York, would you have all your holders within your works?

A. I would endeavor to have them as near as I could.

Q. Would you have all your works within the yard?

A. I would in New York, I would not in your city. That would depend altogether upon the formation of the ground. I would select a place rising gradually from the river. I would not put all my stations here at the works, I would want the risk divided. I would at a certain distance erect a station, and then another, and so on, as many as might be necessary. I should want the city of Boston surveyed, taking all the low ground, and judging what the surface of consumption would be, and I would strike directly at that. I would lay my arteries in the low ground, and then I would have the branches run off from those. If I could, I would arrange them so that the gas would not be communicated immediately from the low ground to the higher. At certain distances from the works I would erect gas-holders. These gas-holders I would fill during the day, that the gas might gradually

be drawn from the holders to supply the city during the evening, so that I could get a sufficient quantity from the works — and I would have a supply for each neighborhood in each holder, and keep the supply uniform.

Q. Do you know that you cannot regulate your pressure on our ground, just as you do anywhere else? If you rise from low ground to high ground, you have got to go there and regulate your pressure. Can't you put valves there, so that the pressure will regulate itself?

A. It would help. You might put governors or regulating valves. I had governors in use at one time in our works; but I was so dissatisfied with them that I had to take them all out. We have a "tell-tale" at our works, and a man stands there and watches it. The pressure is changed, beginning with the day pressure, and gradually increased and kept on until about nine o'clock, and then diminishes until daylight.

Q. If you have governors at your receiver, and you let your gas right into this receiver instead of your station, where do you start your gas for distribution?

A. This gas has nothing to do with distribution. The governor is always on the outlet of the gas-holder. Each gas-holder has two pipes.

We have several holders distributed through the city. We have two at 18th Street, two at 17th, four between 16th and 17th, two between 19th and 20th Streets. They are not a very great way from the works; but the gas is all brought back to the works again from these, and sent through one particular discharge pipe.

Q. They are all contiguous to your works?

A. They are one-quarter mile off. We have six gas-holders at 14th Street between Avenues C and D; and now we are building two in 18th Street, that is three or four streets off, and between Avenues A and B.

Q. (by the chairman). When you took your charter from the city of New York, you obligated yourself to furnish gas to the citizens at a fixed price?

A. That was not when our charter was first granted, but when we asked for an increase of capital, we promised it.

Q. Is not Moses Taylor a large stock-holder in your Company?

A. Yes, sir.

Q. Does he not count his stock among his most valuable stock?

A. How can I possibly know, sir?

Q. Have not he and his family got over $600,000 of it in their possession?

A. Yes, sir.

Q. The only reason that your stock don't pay is, that you have been manufacturing gas that has increased in cost in consequence of the war?

A. We have had to pay war prices for every thing, and have had to receive paper instead of specie.

Q. Were you thinking of giving up your gas works now that specie payments are coming back?

A. We are going to give up our charter, and work independently.

Mr. NASH. What did it cost your company to get the City Council to rescind that old contract to furnish at $15?

A. Is that a fair question to ask an honest man? I don't think that is kind treatment to a gentleman coming here to give you information.

Mr. STEVENS. I beg that the gentleman will not include all the Committee in his feelings. I shall move and hope some gentleman will second my motion, that no questions shall be put to a witness without a vote of the Committee. Will you put the motion?

Mr. NASH. I will when I get ready. I consider that I have a right to ask any question of a witness I choose; and I appeal to Mr. Jewell, if, in all Legislative Committees, such is not the custom?

Mr. JEWELL. If you appeal to me, Mr. Chairman, I must say that I never heard a question of that character asked.

Adjourned to meet at 7, P. M., Wednesday.

WEDNESDAY, Dec. 12.

The Committee met agreeably to adjournment, and the examination of Mr. Charles Roome was resumed.

Q. (by Mr. Jewell). Col. Roome, have you had an opportunity, since yesterday, to test the quality or illuminating power of the Boston gas? If so, state when, how, where, and the result.

A. I tested the gas of the company at the office of the Boston Gas Light Co., this morning, in connection with Dr. Storer, who,

I believe, is the chemist of that company. I found the gas to be over 20 candles.

Q. Have you been able, since yesterday, to make any estimates of the size and cost of the pipes necessary to convey gas from a distance of three to five miles for the supply of the City of Boston? If so, will you state to the Committee what investigations you have made and with what results?

A. I don't know that they are strictly accurate, but I will give the data on which I base them. I had a conversation with Mr. Starr, (who will be here and testify for himself), and he told me he was making 48 inch pipes for the Brooklyn water pipes; that they would average about 700 lbs. to the foot, and cost about 3¼ cts. a lb. That will make the iron alone cost $22.75 per foot.

He stated that those pipes would be heavier than would be required for gas works, but in his judgment, and my own, it would not be safe to make 48 inch pipes less then seven-eighths of an inch in thickness. If they are seven-eighths of an inch thick, which they ought to be, so as to make them safe to handle, and safe when laid in the ground, they would run (including the hubs) about 500 lbs. to the foot. Mr. Starr informed me that if he had to make the pipes of the same size, and make them lighter weight, the labor would be greater in proportion than it would for the other pipes, and he could not make them for less than four cents a pound. If that is the case, they would cost $20 a foot. I don't know any thing about the ground that these pipes would be laid in — whether clay, or sand, or rock; but about a fair average is to add one third of the cost of the pipe for the cost of laying, digging the trench, furnishing the lead and yarn, making the joints, and filling up the trench again. That is a calculation I have often made, and found it, as a general thing, run pretty accurate. Sometimes it is a little less, and sometimes a little over. But say one third the cost of the pipe will lay it. Then it is customary to add four to five per cent for the joints; I have only calculated four per cent.

These pipes are cast in lengths of twelve feet, and there are six inches and upwards of depth of socket; so that a pipe twelve feet long when laid will only measure about 11½ feet in the ground. These pipes must be laid deep enough to get below the frost. I don't think it would be safe to lay them without four feet of earth over them. The pipes being four feet, that would make eight feet, and you would have to dig a foot for the joints. Those pipes, there-

fore, would be laid in a trench nine feet deep, and I don't think they could be laid for less than the price I have estimated. Now, a 48 inch pipe, five miles long, under a pressure of three inches, would furnish about 600 thousand feet an hour; and I am told that, allowing for the natural increase of business and growth of Boston, if works were to be built five miles off, these pipes must be about four feet in diameter. Now, the cost of a pipe 48 inches in diameter, if it weighs 500 lbs. to the foot, at $20 per foot, $105,600 a mile, 5,280 feet to the mile. Add four per cent for the joints, $4,224. That is, $109,824. Add one third for laying, including lead, yarn and labor, $36,608. The cost of a 48 inch pipe per mile would therefore be $146,432. That is about the size that would be required, I am told, when you go five miles off, and want to supply 600,000 feet an hour.

Q. With a consumption of two million feet a day, at this moment, would it be safe to build works which should not provide for an increased supply, equal to a certain number of feet a year, at least?

A. In my judgment, it would not be well to build your works for this year only, or for next. It is not customary so to do.

Q. The natural increase of consumption would make larger pipes soon necessary, would it not?

A. Yes, sir. You might lay a 36 inch main, and work it under a four inch pressure, through a length of three miles, but you could only furnish 356,000 feet an hour. Therefore you might, if 356,000 feet an hour would answer your purpose, and you only wanted to go three miles out, lay one main now, making provision to lay another by and by. That could be cast to be three quarters of an inch thick, and would weigh 300 lbs. to the foot. Mr. Starr informs me that he could make that for $3\frac{1}{4}$ cts. a pound. That would cost $9.75 a foot. Now calculating, as I did in the other case, 5,280 feet to the mile, at $9.75 per foot, that would cost $51,480 per mile. Add four per cent, for joints, $2.059. That is $53.539. Add one third the cost of the pipe for laying, $17,846; which would make the cost of a 36 inch pipe per mile $71,385. Now, a 36 inch pipe, under a three inch pressure, if you only go over about 5,000 yards, would supply 407,000 feet per hour. Under the same pressure, if you go 7,500 yards, it would supply 332,000 feet per hour. If you go 10,000 yards, it would then only supply 288,000 feet per hour. Therefore, if works are to be built outside of the city, with these data, and data which could be procured in

a similar way, you could find out about how much money you would have to expend to go out of the city. If you lay a 24 inch main, (without calculating for the loss by friction, &c.,) of course it will take four mains of 24 inches to be of the capacity of one of 48 inches.

A 24 inch main can be cast $\frac{3}{4}$ of an inch in thickness; and at that rate, allowing for joints, it would weigh about 200 lbs. to the foot, and it would cost about $3\frac{1}{2}$ cts. a pound to cast that. That would be $7.00 a foot. Now, calculate at the same rate as before, 5,280 feet, at $7.00 a foot, and you have $36,960. Add four per cent for joints, $1,478.40; which makes $38,438.40. Add one third for laying, $12,812.80. So that a 24 inch pipe per mile would cost $51,251.20. Therefore, if you should lay a 24 inch main, and by and by should want to come up to the capacity of one of 48 inches, you would have to lay four of them. Therefore, instead of spending 146,000 in the first place, you would have to spend over $200,000 a mile before you got through. A 24 inch main, under a pressure of $2\frac{1}{2}$ inches, at a distance of 3,000 yards, would only discharge 172,000 feet an hour.

Q. As a matter of economy, then, the 48 inch main would be preferable, in your judgment?

A. I can only say, that if the city are going to do any thing, they are going to do something to last for all time, and they would want to make it permanent. If I was going to build works for my own Company, to go out five miles, I think this is what I would do; I would put down a pipe four feet in diameter.

Q. (by the Chairman). You made these estimates in currency?

A. Oh, yes, sir.

Q. You would deduct 30 per cent for the gold valuation?

A. I merely estimated what they would cost to-day in the market; what you would have to pay in currency to-day for pipes and labor.

Q. Then you would make 30 per cent deduction for the gold valuation?

A. I merely calculated the market price to-day. I have not entered into any calculation with regard to gold at all.

Q. (by Mr. Jewell). Col. Roome, there was some testimony given here with reference to the specific gravity of gases, as

though the quality of gas depended entirely upon the specific gravity; that is, the illuminating power and specific gravity were proportionate. Will you state whether that statement is or is not a true statement?

A. Well, we gas-makers don't estimate that way, sir. If gas was entirely free from carbonic oxide, carbonic acid, and nitrogen, perhaps that would be an approximation, in some way; but it is not the way that gas-makers take. I never knew any chemist, that I have to do with, who considered the specific gravity as a test of the illuminating power of gas. Now, olefiant gas, one of the most valuable constituents of gas, has a specific gravity of 0.978, air being 1,000. Nitrogen, which gas always contains, has also a specific gravity of 0.972, and carbonic acid has a specific gravity of 1.529, air being 1,000. Therefore, the olefiant gas, which is a very valuable constituent in our gas, is very near the same specific gravity as nitrogen, which has no value at all, and carbonic oxide much less specific gravity, which is a positive injury. Now when an ultimate analysis of gas is made, they do take the specific gravity, but it is merely as a check on their calculations. The gas is analyzed to ascertain what portion of the hydro-carburets it possesses, for there are others, as distinguished from olefiant; how much olefiant it may contain, how much hydrogen it contains, and how much of all the different gases that are found in that complex substance called illuminating gas. The quantity of each having been ascertained they are added up, and the specific gravity being taken, it is a mere check to find out if there is any error in the calculation; but the specific gravity *per se* is not the test of the illuminating power of gas.

Q. Something has been said with regard to the use of Cannel coal. Will you state whether or not any considerable use of Cannel coal by the Gas Companies on the Atlantic coast would have any effect, and, if any, what effect upon the price of Cannel coal?

A. Cannel coal is more used in England than it was a few years ago, and the area of production is no greater than it was. The consequence is, that the cost of Cannel has increased very materially. I bought it years ago in Liverpool for eleven shillings sterling. I don't think it can be purchased now for less — well, I don't know, I haven't bought any lately, but it has got up to eighteen or twenty shillings sterling, and will probably go still higher. I think the last quotations I read were about twenty

shillings. It will grow scarcer, and as the demand increases, of course the price must increase.

Q. Have you ever used Albert coal, so as to be able to determine the amount of Albert that can be profitably used in making gas?

A. I have not used Albert coal for a number of years. I did use it, when it was much cheaper than it is now. About the time it was first introduced, I think, I did use the Albert coal. I don't think, if I recollect right, that you can use over about ten per cent of it. I think that was my judgment. I tried to use more than that, but was obliged to give it up.

Q. State what were the difficulties attendant upon the use of it.

A. Well, it is an extremely rich material; far richer than what is ordinarily called Cannel coal. It does not look like it. I suppose in its composition it is nearer the Boghead Scotch, or perhaps approaches the Breckinridge coal, of Kentucky. There was quite a suit some years ago in which it was a disputed point whether the Albert coal was really a coal or an asphalt, and Dr. Jackson, of this city, Mr. Cresson, of Philadelphia, Dr. Torrey and Dr. Ellet, of New York, very eminent chemists, were called to testify in regard to it. There was some question as to the title to the land, or the royalty, or the right of the Queen to the ground — I don't know what; but the legal question turned upon the point, Is the Albert a coal, or is it an asphalt, as chemists term it? They decided it was a coal. But it does differ; it is unlike any other coal I ever saw. It is an extremely rich material, making little or no coke, and the coke don't amount to any thing. At least, I found it so. But it is a most extraordinary article, rich in the extreme, and far, very far superior to any English Cannel I ever saw.

Q. The consequence of using a larger portion than ten per cent was to cause what effect in the gas?

A. It would cause the gas to smoke, undoubtedly, and I think there is where you see the excess. I noticed, when I was using it, and trying to crowd it, that it seemed to affect the throats of people where it was burnt. It was not thoroughly consumed, and we had to fall back upon a certain quantity. Go beyond that, and there seemed to be a certain something which was deleterious — what, I really do not know. Some chemists thought it was im-

aginary with me, and perhaps it may be so; but it is an extremely rich material, and has got to be handled with judgment.

Q. Ten per cent of Albert coal mixed with another coal, in producing illuminating power, is equal to what aliquot part of Cannel?

A. I don't know that I can answer that question directly. I should have to make thorough experiments to try it. But I tried the Boston gas to-day, which I was told did not contain ten per cent of Albert, or exceed it, and I found that over 20 standard sperm candles, according to the common mode of testing gas; and therefore Boston gas, this day, according to that test, and my best judgment and sincere opinion, is equal to ordinary Cannel gas?

Q. And that test was made at the office in West Street?

A. Yes, sir, at the general office of the Company. I asked permission to test it, for, as I stated, no man living can judge by the naked eye. You can tell that gas is bright gas, or good, but no man can pretend to tell its illuminating power. It may have varied a little from the calculation, but according to the figuring, the gas came up to over 22; but the candle would vary a trifle, and the gas burner would vary a trifle. When I test gas at home I generally take 15 observations, and then take the average of them; but I am perfectly satisfied in my own mind that that gas which I tried at the office to-day, which was gas drawn from the street (at least, I suppose so; I have no idea that they would practise deception upon me), — there is no question in my mind that that gas is twenty candle gas, and equal to the Cannel gas that is delivered to the consumer. Please understand me, sir. There is a difference between a laboratory experiment and a plain working experiment. You test Cannel gas in the laboratory, and you will get 24 candles; but you do it there under the most favorable circumstances; but try it with the rough and tumble working of ordinary houses, and it will be about 20 candles, as the town gas of Liverpool was when I tried it; and the gas in Boston is just about the same.

Q. Did Dr. Storer, the chemist of the company, attend you?

A. I was introduced to a gentleman there as Dr. Storer, who, I was told, was a Chemistry Professor here somewhere.

Q. Did you have any conversation with him to learn whether or not the gas to-day was of the same quality as the Co.'s gas usually?

A. Yes, sir.

Mr. STACKPOLE. It strikes me that for this witness to testify what Dr. Storer told him is exceeding the ordinary bounds of testimony, even before this Committee. Dr. Storer is in the city, and can come here and testify what he saw. I know we are not bound by the rules of law in this hearing, but I think there are certain ordinary rules of common sense which ought to be observed.

Mr. CURTIS. We offer it for what it is worth, to be corroborated by Dr. Storer.

Mr. STACKPOLE. I submit the question to the Committee. There are some bounds that ought to be observed here.

Mr. CURTIS. You have not observed them.

Mr. JEWELL. I understand that the witness desired to test the gas of the Co.; and in order that he might do it, the chemist of the Co., Dr. Storer, was sent for; and Col. Roome was introduced into the chemist's private room, and made the experiments with the chemist himself. The gas was examined, and we don't want to have anybody suppose that the gas of to-day is better than it was yesterday or any day this month.

Mr. STACKPOLE. Then Dr. Storer can come and testify. It seems to me that there are common sense bounds to testimony here.

THE CHAIRMAN. He states that he asked permission to test the gas, and was not asked by the Co. to test it.

Mr. STACKPOLE. I suppose the Company want to put in by this witness what the quality of the gas has been for some time past. They have got Dr. Storer, who can testify about that, and this witness can say nothing more than what Dr. Storer told him about it. I know we are not bound by the strict rules of testimony in courts of justice, but I think there are common sense rules, and that it is not competent for this witness to state what Dr. Storer told him about the gas in past times, when they have

Dr. Storer in town, and can put him upon the stand. In my judgment, that is testimony which should not be admitted here.

THE CHAIRMAN. Dr. Storer is all the time in town, and can be called.

Mr. CURTIS. The only question is whether the Committee want information on that point or not. We understand that we are somewhat circumscribed for time, and the testimony of this witness may save us the necessity of calling Dr. Storer.

THE CHAIRMAN. I suppose Dr. Storer will be present, to be examined by counsel on both sides.

Mr. JEWELL. I did not expect my question would cause so much discussion. I understood the witness to say, that in consultation with the chemist, he asked him if this was the usual grade of gas, and got a reply. That is all I want to get in. He examined the gas, tested it, and says to the doctor, "Is this the usual quality of your gas?" and the doctor replied. I only want to get what that reply was.

THE CHAIRMAN. A gentleman came to me and asked me if he could make a statement of what his neighbor told him. I told him I did not consider that the right kind of evidence, and didn't think the Committee would admit it; and he went off.

Mr. JEWELL. I don't think it very material, but I think it ought to be answered, because it is a fact that took place in the private room of the chemist. I will not press the question.

Q. (by Mr. Curtis). Something was said here last evening in reference to the failure of your Company to pay dividends as being attributable to loss of coal by spontaneous combustion. How is that?

A. We undoubtedly lost by spontaneous combustion. We had considerable coal burned up last year. We have had some burned up this year.

Q. Does that affect the question of the ability of the Co. to make dividends?

A. No, sir. I don't recollect how much we lost, but as nearly as I can recollect, it cannot have been far from $20,000. It was a pretty serious fire, and we lost a good deal of money.

Cross-examined by Mr. Stackpole.

Q. This gas that you tested to-day was tested with a burner and at the pressure supplied by the Co., was it?

A. Yes, sir. It was a 15 hole argand, with a seven inch burner. About the ordinary standard burner, I should judge.

Q. The experiment was made with a view to your testifying here to-night?

A. Yes. I will tell you how it happened. When I was in the office, I said, "I was asked to tell the quality of the gas by the eye; I cannot do it. Will you give me an opportunity to test your gas; and if you will, I should like to have your chemist here, so that he can be satisfied that I want to make a fair test; and if so, I will be obliged to you if you will send for him." They said, "Yes, with great pleasure; we will send for him." "Will you be kind enough to light up, so that the stagnant gas may burn out, and we will get the gas right fresh from the main?" They said, "Certainly, any thing you wish." The Dr. came; I was introduced to Dr. Storer; he went up stairs; and before he got ready, I went up and saw him weigh the candle, took the index of the meter, examined the burner, and went over the calculation with him.

Q. The experiment was made by him and yourself?

A. We made it together. He went out of the room and shut the door on me. If you have ever seen the gas tested, you know it is done in a room painted black; there is no light; even the holding up of a hankerchief would affect the result. He left me in the room. I took an observation, pushed the photometer, and went out and left him to go in and adjust it himself. He said, "I don't make it as high as you do." I said, "The light will vary; the candle will vary; I never decide upon one observation." I went in and adjusted it again, and finally we agreed. I don't think we would vary a tenth of a candle.

Q. You testified that your works were no damage to the neighborhood. Has there not been a good deal of complaint of the works?

A. Not of the works. There was complaint by the Board of

Health of the odor arising from the purifying house. That was remedied, and they were perfectly satisfied, and have so stated publicly.

Q. Has there not been a great deal of complaint with regard to the water used there?

A. Not that I know of.

Q. Don't you know that Inspector Blaisdell has said that this liquid is a nuisance?

A. I don't know of any such inspector; I never heard of him, sir.

Q. Is he not in the Metropolitan Board of Health?

A. I don't know. I don't remember to have heard the name before. There may be such a gentleman, but I don't know it.

Q. You never heard, then, of this report, which I will read to you? It may recall it to your recollection: — "The Manhattan Gas Company uses every day 100,000 gallons of water for purifying their gas. This water, after being used for that purpose, is allowed to flow from their works through a sewer into the East River. It takes away with it all the impurities of the gas, together with a small portion of coal tar. The Company do not throw any of their refuse matter into the river, save what flows through the sewer. It is a fact that the river is at all times impregnated with this offensive liquid containing coal-oil. The water along the docks, from East Twenty-second Street to below Grand Street Ferry, is constantly covered with coal-tar oil, making it very offensive to those who live in that vicinity, as well as those who work in the numerous shipyards that abound in that locality. The ship-builders say it is an injury to their business. It certainly is a nuisance that should be abated as far as possible.' Do you know of any such report as that?

A. Never heard of it before. Dr. Stone, who is one of the Board, came down, and I was with him when he stood at the dock and looked over. He said, "Is that all?" "Yes." "Well," said he, "I don't see any thing there to find fault with."

Q. What is the par value of your stock?

A. $50 a share.

Q. And what does it sell at in New York?

A. I don't know. That question was asked me the other night. I have seen statements made in the paper that the stock was selling say at $120; but that don't mean that a share costing $50 sells at $120, but $60.

Q. Is it not quoted at $180?

A. I have not seen it. If it is quoted at $180, it means that a $50 share would sell for $90. If it is sold for $180, I have not heard of it.

Q. When your capital was increased, what was the method of increasing it? Was the stock given to the old stock-holders at a certain price?

A. When the capital was increased the last time, then a dividend was made of the surplus on hand at the time, that was called in, and stock was issued for the dividend which was then declared.

Q. How large was the dividend then?

A. I don't recollect.

Q. Can't you say whether it was five, ten, twenty or fifty per cent? Give us some idea.

A. I don't know that I can, but the books were made up, whatever the surplus was, it was divided among the stock-holders, and some money was called in.

Q. That was really dividing an extra dividend?

A. Yes, sir.

Q. And you can't say whether that was more or less than 25 or 50 per cent?

A. I will try to recollect if I can. I think that dividend was about $700,000.

Q. I want to find out how much percentage it was.

A. Our capital paid in before that was two millions, and that is the amount that had accumulated up to that time.

Q. Your original capital was $500,000, I think?

A. Yes, sir.

Q. Your present capital is four millions?

A. Yes, sir.

Q. Has your capital been increased in that way, as a rule?

A. No, sir; that is the only instance. In every other instance, it was cash paid in.

Q. Who was allowed to take stock?

A. The stock-holders who held at the time share for share.

Q. At par?

A. At par.

Q. And no matter what the stock would sell for in the market, they were allowed to take it at par?

A. The stock was divided among the Company. Whatever he

could get for it, the man who held a share of the old stock received a share of the new stock.

Q. Then it made no difference what the stock was selling in the market for, he got his at par, even if he could take the new stock that he got at par and sell it the next day for fifty per cent advance?

A. Yes, sir; it might have been. It was divided share and share alike.

Q. In making your calculation in regard to the cost of gas, and stating that, selling it at $2.50 per thousand feet, you made no profit, I suppose that included all the expenses of the Company?

A. Every thing. No interest on the capital, but all taxes and expenses for salaries, distribution, &c.

Q. Your corporation have made strenuous efforts to have this charter revoked before the Legislature or the city?

A. Not before the city. We have tried to have that clause stricken out before the Legislature.

Q. And you have been engaged in a number of lawsuits, for one reason and another?

A. If a man don't pay his gas bill we sue him. We have one lawsuit with the city, with regard to the public lamps.

Q. And all the contingent expenses go into the cost of the gas, whatever they may be?

A. No, sir; not into the cost of the gas.

Q. They go into the expenses of the Company, by reason of which you say you cannot sell the gas for $2.50 per thousand?

A. They will. We have not paid our lawyers much. That has all got to come yet. We have not paid them any thing, except a retaining fee, perhaps, or something like that. We have not paid out much for legal expenses.

Q. Did you deduct from your calculation the other night the price of the coke sold?

A. Yes, sir; I stated the cost of the coal less what we received for the coke and tar.

Q. Was the cost of the coal 93.84?

A. That was the net cost, after deducting all sales of secondary products.

Q. And you made the cost of the gas $1.63 and some fraction?

A. Whatever it was.

Q. What are the other expenses that bring that up to $2.50? You did not give those I think.

A. I could get those at home. I was not prepared for this examination; I merely took what I got from the Annual Report.

Q. You put on very nearly a dollar more?

A. Yes, sir.

Q. I should like the particulars of that.

A. I have not my books here. There are no salaries, no taxes, no insurance, no anything. This is the mere cost inside the retort house, for labor alone. There is nothing with regard to repairing the street mains.

Q. You cannot give the Committee those particulars?

A. I am not able to give them. I have not got them.

Q. Colonel, are not the gas works of Paris some considerable distance at present from the centre of the city proper? I mean to say the centre of the large population.

A. Yes, they have built new works since I was there. I think I stated I was there in 1855. I recollect now it was 1857, the last time I was there. There were gas works out near the edge of the city; I don't recollect the name of the place.

Q. And the gas is sent through mains a number of miles?

A. Yes, sir.

Q. About how many?

A. If I recollect right, I think from the gas works down into the centre of the city (I don't know how far they go along before they are tapped) it may be perhaps three miles.

Q. Is there not considerable agitation now in foreign cities, in London and Paris, in regard to the sanitary effects of gas works?

A. Yes, sir. London is always in hot water about her gas works. I never knew it to be cool.

Q. It is at the present time on that point?

A. I don't know whether it is on that point particularly or not; but the London Gas Companies have been in hot water ever since my early manhood, and I suppose they will be until the day of judgment.

Q. Haven't you heard that there is a good deal of agitation on the subject now?

A. I know that is so; that it is before Parliament, and Lord Redesdale has a good deal to do with it, and there is a great deal of complaint.

Q. And a great deal of complaint that they are unhealthy?

A. Yes, sir; that they are every thing that is wicked.

Q. And in consequence of that agitation they have passed a

law limiting the price of gas, and passed a long Act of Parliament?

A. Oh, yes, several of them.

Q. That was the result of public hearings and Committee hearings?

A. Yes, sir, I suppose so, in Parliament and the City Council of London.

Q. Were there not Committees of Parliament?

A. Committees on Committees, agitation after agitation, and opposition to the Gas Companies continually. The truth of it is, Mr. Stackpole, as I said before, they never had any peace, and they never expect to have any.

Q. Until they have got them settled as they want them?

A. If you ever get gas works settled as people want them, you will get millennium. I never expect to see it.

Q. What I wanted to ask was, whether there had been Committees appointed from those gentlemen in the House of Commons who have taken the most interest in the matter, who had public hearings on the subject, which resulted in the present Metropolitan Gas Act?

A. There have been Committees, whether of those who took the most interest I can't say; Committees after Committees, application after application, complaint after complaint, law after law.

Q. And that has resulted in the present Metropolitan Gas Act?

A. Yes; that and several amendments; and they are at it again now. They keep it going. I have got quite a number of amendments. However, they have had a great deal of trouble, and they have arrived at this present stage; but it is by no means a settled state of affairs.

Q. Which class of retorts, clay or iron, are now in general use?

A. I give the preference to clay. I think they are gaining on iron all the time. I prefer them; others do not.

Q. How many miles of pipe have you in connection with your works?

A. I think we have about 130, if I recollect right.

Q. Do you know how many miles the Philadelphia Gas Works have?

A. I do not.

Q. I suppose the more compact a city is, the less expense there is in that regard; and that is a great advantage, is it not?

A. Undoubtedly, a very great advantage.

Q. You get $24 for your present street lamps?

A. No, sir, we don't get any thing. We had $15.00 for 2,300 hours, by contract, which is equal to $25.00 for 3,833 hours and 20 minutes.

Q. In relation to the repeal of that contract by the City Government, has not the Comptroller, Mr. Brennan, sent a communication recommending that it should not be repealed?

A. No.

Q. That is his opinion in regard to the matter?

A. Yes, sir.

Q. Does he not oppose the amendment of your general charter?

A. I don't think the Comptroller said any thing about that. His communication is in regard to the public lamps for the city of New York.

Q. Was his recommendation carried out?

A. I don't know what he has recommended. He protested against the annulling of the contract.

Q. Has the contract been annulled?

A. We maintain that it has; the Comptroller denies it, and that is what the lawyers have got to fight out.

Q. With whom is your suit?

A. The city.

Q. The city deny that the contract is annulled?

A. Yes, sir.

Q. You are in conflict with the city?

A. Yes, sir.

Q. You stated the quality of your gas in New York; that is your own test, not that of a State Inspector, because there is no State Inspector?

A. There is no State Inspector.

Q. You stated last night, I think, that the Boston Gas Works had been arranged as well as might be, considering that they were built some time ago. If new gas works were to be erected, couldn't they have more convenient arrangements than the Boston Gas Works?

A. I said so; that if I had a clear piece of ground to build on, I would make them more convenient and more symmetrical, but I didn't know as I could make them more efficient.

Q. Can they be made more economical?

A. I don't know that.

Q. Does not convenience tend to economy, as a rule?

A. I don't want to reason in the abstract.

Q. You have been doing a good deal of abstract reasoning?

A. I have only answered questions.

Q. Well, this is my question; whether convenience would not tend to economy?

A. It might in some cases. I don't know how they could make gas more economically in those works than they appear to be making it. I could make them neater; I could lay them out in lines. These things I should do with reference to architectural display. At my works you will find grass and trees; and the laboratory you will find a beautiful establishment, costing some $30,000. All that is very elegant.

Q. When did you last see the Boston Gas Works, before this last time?

A. Not since the Rebellion broke out.

Q. Then your testimony in regard to them is what you were shown on going through them?

A. Yes; I walked through them.

Q. In regard to this rich gas made in Liverpool and Manchester, if burned in proper burners, is there any necessity for its smoking?

A. I could burn it without smoke, and so could you, if we were to make a study of it; but the people along the streets and in the houses don't do it. You can burn oil gas without smoke, which is richer than any Cannel, but it does smoke.

Q. If they get the proper burners, is there any objection?

A. There is no objection to its burning. There is no objection to your burning such rich gas, if you wish it. You get a smaller flame, but it is not a satisfactory gas, as a general thing. I find the people are dissatisfied. I found as much complaint against the gas in Liverpool as I have found in any place I have been in, by those who burned it. They said the light was not good, and they found fault with it. The gas is pretty rich, and they must, at least they do, use fish-tail burners.

Q. How many feet of that is it best to burn in an hour?

A. With Cannel gas, they don't generally use more than three feet burners. I saw a great many burners there in their windows and other places that didn't burn over a foot and a half or two feet an hour; and again in some places you would find them burning four and four and a half feet.

Q. What is the illuminating power of gas burning at that rate?

A. The town gas, in the laboratory, would be about 20 candles; Cannel will make 24 in the laboratory. But in the ordinary mode of using it, it would not come up to that.

Q. Running at the rate of one and a half or two feet wouldn't it have that?

A. When you are going to test Cannel gas, you have got to test it burning five feet an hour. When I say that a gas is ten or six candle power, or whatever it may be, I mean that five feet of that gas, consumed in an hour, will give as much light as so many sperm candles, burning two grains a minute.

Q. If you burn five feet an hour, don't it smoke?

A. You couldn't burn five feet an hour any way. It would stream out of the top and smoke.

Q. Wouldn't three feet of that gas really give more light than five, because there would be less smoke?

A. If you used an improper burner, certainly it would. But you might get a fish-tail burner that would consume five feet. I think you can burn four or four and a half feet without smoking very readily.

Q. You can't burn five?

A. Not very well. I think about four feet is as high as you can get.

Q. Can you get as high as four?

A. Oh, yes.

Q. Were you not at some extra expense last year? Were there not some accidents?

A. Only the burning of the coal.

Q. How much did you lose by that?

A. I think our engineer estimates it at about $20,000.

Q. How were the repairs? about an average or an excess?

A. About the same.

Q. Any extension of the works during the year you have spoken of the cost?

A. No, sir.

Q. Wasn't there some alteration in changing the position of the works from one side of the river to the other?

A. No, sir.

Q. Is there this year?

A. We are now building new tanks and holders.

Q. That is rather extra?

A. It is extra; it is an enlargement.

Q. In speaking of the sanitary effects of your gas works, did your remarks apply to the workmen, or to the citizens living round them?

A. I was speaking of my men alone.

Q. Not of the people round the works?

A. No, sir.

Q. I suppose, in going into a gas light company's works to make examination in reference to a nuisance, the fact that you are in the habit of being in gas works makes some difference whether you experience the same effects as others?

A. I am not in gas works a great deal now.

Q. You have been all your life?

A. Oh, yes; I have been, a great deal. I don't know how that would affect me. I don't think an unpleasant odor is any more agreeable to me than to others.

Q. You said that the Boston Gas Co's retorts were not so hot as others when you saw them?

A. No, they were not.

Q. I think you also said you had heated your retorts to a higher heat, in order to get more gas, and of a purer quality?

A. Yes, sir.

Q. That is the reason of the difference — that you have lately heated your retorts to a higher heat?

A. I have differed from some engineers in regard to that. I have always believed in working under very high heats, and charging heavily. I charge heavier than they do here.

Q. I think you stated that you had heated so as to get 9,836 feet from a ton, and that the gas was purer when made at a higher heat?

A. Yes, sir.

Q. You have said that you thought it might be unwise to change from iron retorts to clay retorts. That would not affect a new company just going into operation, I suppose?

A. They would not be obliged to make any change at all.

Q. They could probably get workmen to work as well with clay retorts as iron?

A. I see no difficulty.

Q. When a company supplies lamps to a city, is there any rea-

son why the company should not be able to attend to these burners, so as to keep them burning an amount not over five feet?

A. Not that I know of.

Q. So if they burn over five feet, it is their own fault?

A. That depends upon whether the company have charge of them.

Q. If they were allowed access to them, would it not be so?

A. If they were allowed to change them, of course.

Q. And during cold weather, when the thermometer gets under ten degrees above zero, is there as much gas consumed as in moderate weather?

A. I don't see what that has to do with it.

Q. Does not cold weather have an effect on gas so as to make it burn dimly?

A. The weather may affect the quality of the gas, and undoubtedly does.

Q. Does it not affect the amount of gas passing through the pipes?

A. No; I don't think it does.

Q. When we see gas burning with a blue light, is there as much gas consumed as at other times?

A. Not if there is frost in the pipe, partially closing it. I will tell you how that happens. In extremely cold weather, the lights will burn very clear indeed; but when the weather moderates a little, the lamp will go out. The reason of that is the moisture in the gas. In the gas-holder vapor is constantly rising, which passes through the mains in the streets and up the lamp-posts, or into the meters, and it condenses on the sides of the pipes, there forming just exactly like frost. Then this thing occurs particularly on the north side of a street. When the weather is extremely cold, and as long as it remains cold, the gas will continue to burn very clearly; but when there comes a warm sunshining on the lamp-post, it heats it not enough to melt the frost, but enough to detach it from the pipe, and it will fall and lodge below, and the gas is entirely shut off.

Q. In a variable climate like ours, where we have the thermometer going up or down 50 or 60 degrees in 24 hours, this occurs not unfrequently, I suppose?

A. Yes; but the moment that occurs, we send round and pour whiskey into the pipes.

Q. A burner wouldn't consume five feet an hour, then; would it?

A. That won't happen more than once in two months.

Q. If the gas don't go through the pipe then, of course it don't burn any thing?

A. Of course not.

Q. The difficulty in distributing gas is greater when the works are on higher ground and the people using it on lower than in the opposite case?

A. Yes; it requires greater pressure, of course.

Q. Do you know of any extraordinary difficulties in engineering here in the city of Boston because we have land higher than where the gas works are?

A. I don't see any engineering difficulty that could not be overcome with a little skill.

Q. Is there any extraordinary degree of engineering skill required here in Boston?

A. Oh, no. I don't see that it requires any wonderful skill. I don't think it is such a wonderful thing to make gas or distribute it. I think the rules are well established, sir.

Q. It is not so difficult to force the gas up, when the works are on low ground, as it is, if the works are on higher ground, to force it down?

A. It requires more pressure to force it down; gas being lighter than air, you have got to force it against the pressure of the atmosphere.

Q. There were some hypothetical questions put you last night with regard to the value of the Boston Gas Light Company's works. Can you estimate them at any fixed price?

A. I cannot.

Q. You cannot give the Committee any judgment?

A. I can give no estimate whatever as to the value of those works.

Q. Then your statement last night was hypothetical?

A. Entirely so. I was asked what it would cost to build them now, as compared with some time ago, and I stated that, if their money had been judiciously expended at the time, I thought it would cost, to put up the buildings and furnish the apparatus, twice as much money now as it did ten years ago; and I can give my reasons for it, if I am asked.

Q. You were asked last night in regard to the provision of our law which prevents the Inspector from giving an opinion upon any particular burner. Aside from that, would it not be useful,

in your judgment, for the citizens to have some one to whom they could apply to learn the best kind of burner, the best amount of pressure, &c.; some experienced person?

A. I don't know but it would, if he was a disinterested party. The only fear I have is, that if you make it his business to do this thing, he will be interested in favor of some manufacturer.

Q. But if you could have somebody aside from the State Inspector, whose duty it should be to inform the citizens of Boston in regard to their best interests, would not that meet the requirements of the community?

A. There have been so many volumes published, and so many statements in the papers, over and over again, that I don't know what you can do, or in what way you can contrive to make people satisfied, or give them correct information. Your own judgment is as good as mine in that respect.

Q. There is, in fact, a great deal of agitation and dissatisfaction on the subject of gas, is there not? and the science of manufacturing and supplying gas is progressing on all these matters?

A. I don't think the minds of the public are progressing much yet; I think they stand just about the same as they did thirty years ago, so far as their satisfaction with gas companies is concerned. I have never seen any change in public opinion in that respect.

Q. If you burn gas with the burner and at the pressure best adapted to it, whether or not that gas will show a higher quality than the ordinary run of gas burned with pressures and with burners not so well adapted to it?

A. It will, undoubtedly.

Q. And what difference would it make?

A. Well, I can't tell you how great that difference would be. It would be a matter of experiment.

Q. Then, if it should appear by inspection that the Boston Gas Light Company's supply of gas, which, burned with a burner and at the pressure best adapted to it, produced 15 candles, say, it would not follow from that that the whole mass of people, burning with all sorts of pressures and burners, get that quality?

A. Not at all.

Q. Which is the more economical for the consumer, to have the pressure of the gas regulated before it reaches his gas meter, and brought to the correct pressure, or to endeavor to regulate it himself, with the cock at the burner?

A. I think it would be better for him if it could be delivered at precisely the pressure he requires. That is to say, as I stated last night, the less the pressure under which the gas is consumed, the more light you get from a given quantity.

Q. My question is, whether that can be regulated more economically for the consumer by fixing the pressure before it gets to his meter, than by having it pass through the meter and be regulated by the cock?

A. Yes, sir; but it is impossible so to regulate it. If you regulate it to suit one consumer, it would not suit the man next door; therefore, all you can do is to try and use such pressure as will give an abundant supply for all. It may not be quite enough for the man in a low locality, and too much for the man in a higher. You don't want to get too high a pressure for anybody. It is your interest to work under the least pressure possible. The less the pressure you work under, the less you lose by leakage.

Q. Do not consumers waste more gas by a high pressure than low?

A. If they are careless, they do; if they are prudent, they do not.

Q. But ordinary people are careless, are they not? There is little general knowledge compared with what there might be if there were some intelligent instructors?

A. They have instructors enough. It is a good deal like the story of Dives, — if one rose from the dead to tell them, it would make no difference, they would not believe.

Q. It is pretty hard to convince the people?

A. It is impossible to, Mr. Stackpole. The plain English of it is, they will not pay attention.

Q. (by Mr. Jewell). Can it be considered the fault of the Gas Company, if the consumer does not get his gas consumed under the best circumstances, if they furnish a good quality of gas?

A. The Gas Co. are to furnish gas: it is not their place to furnish fixtures and burners.

Q. And having furnished a good gas, and introduced it to the customers' premises, does there seem to be any thing more that the Gas Co. can be expected to do?

A. I don't see how. I suppose a company that might furnish

water would not be held responsible if the people drank too much or too little, so the water was pure, and there was plenty of it.

Q. Is it any more the fault of the Gas Co. if the consumer does not burn it under the best circumstances than it is the fault of the flour maker if the cook does not make good bread?

A. I can't see why it should be.

Q. (by the Chairman). What price do you get for coke?

A. It varies with us some, depending upon the price of anthracite.

Q. At the present time?

A. Customers are paying $3.50. We get $2.50 per chaldron of 36 bushels. We sell it to those who sell it again.

Q. You sell in large quantities at $2.50?

A. We sell a single chaldron, or a hundred, or a thousand, at the same rate. We have but one price, $2.50.

Q. Does the coke and coal tar that you sell pay the interest on your capital?

A. Well, no; it pays some interest, of course; but our coke and coal tar we deduct from the cost of the coal. That is the way we enter it; it is a credit on the coal account.

Q. In your opinion, would your sales of coke and coal tar pay the interest on the cost of your works?

A. No.

Q. Why should there be so much difference between the price of coke in New York and in Boston?

A. I suppose anthracite is much dearer here than with us. I think anthracite is selling with us now at about $7.00 a ton.

Q. When you were in London, did you learn how often they inspected the quality of the gas in London?

A. No. I suppose Dr. Letheby must be testing it every day. He tests for several companies, and receives a salary; I don't know how much.

Q. I mean the parties appointed by Parliament?

A. That is Dr. Letheby. He is the public inspector.

Q. Did you learn how often he inspected?

A. No; I suppose he is at it every day; I don't know.

Q. Did you learn when in London, or have you learned since you were there, that they made two qualities of gas there, one from cannel, and the other from cheaper coal?

A. I was aware of that.

Q. What class of people burn the gas made from cannel coal?

A. I wasn't aware there was any difference. I don't know why there should be.

Q. Don't you know that the cheap gas is the gas used by what they term the "commonalty"?

A. I never heard that expression used anywhere out of Boston.

Q. It was a common national expression?

A. It wasn't common when I was there; at least, not among gas people.

Q. Don't you consider the gas works in the city of New York, all of them, in advance, in regard to improvements, of the gas works in Boston?

A. I can't say I do, sir. I say they are more symmetrical, more regularly laid out.

Q. I don't mean that; I mean in regard to economy in manufacturing gas, and every thing in connection with the most economical management?

A. Well, I like the clay retorts best, or I certainly would not use them. I stated that before — that I was partial to clay retorts. I believe they are the best; I believe they are the most economical, but I am not prepared to say, positively, that such is the case, because it is a disputed point, and has been for years; but, as I stated before, I think clay is gaining on iron and I believe that it will universally prevail; others think not; others think that I am entirely mistaken. It is a matter of opinion with many: but still I hold to my own. I am in favor of clay retorts; I think they are the best; but I am not prepared to say positively that iron retorts are not the best; but I do say positively, that I don't believe I can make better gas out of clay than out of iron; I don't believe the material I make it in will affect the quality of the gas itself.

Q. You have seen the Boston Gas Works, and of course have a perfect knowledge of your own; don't you consider your own a vast or large improvement on the works here?

A. Well, we all like our own children best, and believe they are the best on the face of the earth.

Q. You believe them to be much better than the Boston Gas works?

A. I say they are more beautiful. I don't know how they can be any better than the others. I believe, as I said in the first place, that our works are more symmetrical, and while I think they are

more convenient, I am not prepared to say that I can make better gas in my works than I could make in the Boston works.

Q. That is not the point I want to get at. I don't care about beauty or symmetry, I want to know whether you consider your works, with their improvements, of every kind and name, superior to those of Boston?

A. I do not.

Q. There is nothing superior to them?

A. I don't know of any thing, except the retorts. Their purifying arrangements are admirable, and their condensation, and all appears to be very admirable.

Q. Can you make gas more economically from your works than you could from these works?

A. I wouldn't like to say I could. I am not certain that I could. I think that would be a matter of experiment.

Q. Has your company made any extra dividend to the stockholders since 1861?

A. I think not, sir. No.

Q. In your opinion, would it not be a protection and advantage to the citizens of New York and Boston, if there was a State Inspector of Gas, as there is in London, testing its quality day by day, and at night, as they do there, and imparting to the public a knowledge of the quality and condition of that gas?

A. I don't believe it would be any advantage to the public.

Q. I mean a City Inspector, not a State Inspector.

A. I don't think it would be any advantage to the public. I don't think the gas companies would care two straws about it. I should not.

Q. Would it not be an advantage if such an inspector was to answer all questions put to him by citizens in regard to the most economical combustion of gas, and in regard to the best kind of burners?

A. It would depend altogether upon the man's integrity and ability.

Q. If hoar frost forms in a gas-pipe, and disturbs the burning of the gas, when a meter is placed where hoar frost is formed, won't it form in the same manner upon the valves of this dry meter, when it is working?

A. It would, undoubtedly. If the meter was in a very cold place, and there was a condensation there, there is no reason why

it should not freeze on the valve of the meter as well as freeze anywhere else exposed to the cold.

Q. Have you any knowledge of its freezing upon your dry meters in that way?

A. I never have heard of but one instance.

Q. Has it ever come to your knowledge that in England and Scotland the dry meter is condemned?

A. No, sir, never; my experience is just the reverse.

Q. At a meeting of gas men, held in Scotland, they condemned the dry meter on account of hoar frost forming upon the meter, and also on account of the tar stiffening upon the valves, where the meters were left by families moving out of town early in the spring, and not coming back until fall.

A. The same thing happens in wet meters.

Q. Are there any valves for the coal tar to form upon?

A. Yes, sir; I have seen it myself. The gas would pass through without registering at all. Strike the meter gently on the side, and the gas would go out, and then you would not get the meter back again until you poured water in. I have seen hundreds of cases of that kind. In the wet meter, there is a float, which floats in the water. On the top of that float is a rod, that runs up in the small puppet valves, into the chamber where the gas passes through. In cold weather, this that you term tar,—it is not tar, it is oily matter, and the very life-giving property, the illuminating portion of the gas,—this will condense in the gas, and be deposited in the chamber of the meter, and also be deposited on this rod, and cause it to stick. Now, the water, as the gas goes along, is more or less licked up, and is evaporating, and the surface of the water becomes lower and lower, and if the valve sticks by the condensation of this oily matter, then the water gets down below the centre of the drum, and the gas passes directly through the meter without turning the drum round, but the party gets the light precisely the same as if the meter was in operation. Now, you go and tap that meter on the side, and the float will fall and close that valve, and will not rise again until you pour water in. That was a very common trouble we had with wet meters, and a great deal of gas was passed through without being registered.

Q. You use the dry meter?

A. We have not bought a wet meter in eleven years. Our people are very much opposed to the wet meters, and compelled us to give them up.

Q. From any knowledge they have of them?

A. They have the same means of knowing the dry meter that they have of knowing the wet, I presume.

Q. Is there one man in a hundred in New York, who knows much about either?

A. Well, I don't know. I really don't know how much they know. It is a very simple thing to understand, and if they won't take the trouble, I don't know how we can make them understand.

Q. Don't you suppose they would learn, if they had a city inspector to impart knowledge to them?

A. They had an inspector of meters for the city of New York, Mr. Kitchen. I suppose he explained them to the people. They turned him out, and put another man in his place. He was a very intelligent man and a very pleasant gentleman.

Q. Did his inspection amount to any thing?

A. It amounted to as much, I suppose, as any intelligent, upright man's inspection can amount to. I believe he was a perfectly pure and incorruptible man, and certainly he was very much of a gentleman, and a very industrious man, and if that is not a guaranty, I don't know how you can get it in human form.

Q. Was he under any obligation to inspect a meter in New York?

A. Yes, sir, the law compels him to do that. He is obliged to inspect the meter of any man who asks him to. If a man goes to a New York gas office and complains of his meter, and asks to have it changed or wants to have it proved, the rule is — "Now, sir, your meter shall be proved. You can take it to the State Inspector, or have it proved here." There is a gas-holder in the office of the company, sealed by the State Inspector. Any customer can take his meter there and see it proved. If he is satisfied with the proof, well and good; if he is not satisfied, he can go to the State Inspector; or he can go directly to the State Inspector, without going to the Company; and if the State Inspector decides that the meter registers against the consumer, we are obliged to refund to him every thing he has over-paid.

Q. Did you ever hear that the circumstance of a citizen going to the State Inspector to get his meter inspected occurred often?

A. It don't occur very often, but it is occurring at intervals. I have known a great many to do it; but a good many think it too much trouble.

Q. (by Mr. Jewell). A question has been asked about the extension of your works this year. I want to ask whether that extension has been made out of the earnings of the Company or otherwise.

A. How they will eventually be paid for I don't know; but my company is now in debt about $300,000 borrowed money; and that is a good deal more than these extensions will cost.

Q. (by the Chairman). The stock commands a good price, doesn't it?

A. That question has been asked over and over again. As I said before, I never did care two straws about the value of our stock in Wall Street. I never asked any man to buy a share of it; I never advised anybody to sell it; and to anybody who came to me and asked my advice about buying it, I never gave any other answer than, "Use your own judgment; I am merely the trustee of the Company." The market value of the stock I don't know, and I very rarely ask.

Q. Isn't it a very singular thing, that the President of a company should not care how its stock stands in the market?

A. It may be very singular, but I profess to be a very conscientious man. They took me up, a clerk, and advanced me to where I am, which they wouldn't have done if they had not had confidence in me, and I mean to be faithful to my trust.

Q. (by Mr. Jewell). Our law declares that gas shall not be merchantable unless it has an illuminating power of 12 candles. Would it be just to a company to declare its gas unmerchantable unless it was tested under the pressure and with the burner best adapted to the particular gas?

A. I think that every gas ought to have its own burner.

Q. There has been a good deal of talk about the pressure under which gas is burned. Will you explain that matter?

A. There may be three inches on the burner cock, and only three-tenths of an inch on the burner. That does not seem to be understood. When we test gas, the pressure-gauge is between the burner-cock and the burner-tip. Suppose there is a pressure of three inches upon the burner-cock, and the cock is partially open, there is only part of that pressure on the burner; shut the cock, and there is no pressure on the burner. Therefore we place the pressure-gauge between the burner-cock and the burner-

tip. Now, in using a fifteen hole argand, with a seven inch chimney, the pressure on that is seldom more than about two-tenths of an inch, although it may be 3¼ inches on the burner-cock. You must turn it until you find the pressure-gauge attached to the burner itself is only two-tenths; with a fish-tail burner it will burn under seven-tenths. You have got to graduate your pressure by the burner-cock.

Q. That is, the pressure under which the gas is actually consumed is entirely under the control of the consumer by turning the cock?

A. Of course; he can turn off little or much as he pleases. You take an argand burner, and turn the cock wide open, and the gas streams to the top of the glass; you can shut off the force by turning the cock, and the more you turn it, the less that force will be.

Q. (by the Chairman). I will assume that my general consumption in my house is five burners a night. I light these five burners so that they stream up to the top of the chimneys; I go down into the cellar, go behind the meter, and turn the faucet until I get it at an angle of 45 degrees, and some one knocks up stairs and says that is the right standard; am I not burning my gas more economically, in having it pass over the meter sluggishly, and through the pipe with that consumption, than by regulating it by turning the cock?

A. You are certainly doing so, and everybody ought to regulate the pressure required in their house by the main cock on the service pipe.

Q. (by Mr. Jewell). Will you furnish us the additional items of the cost of gas to your company at your leisure?

A. I will be glad to do so.

Q. (by the Chairman). Why do you never use Pictou coal, or but very seldom?

A. Well, I like the coke of other coal better than I like the coke of the Pictou. I can find a more ready sale for it.

Q. You use the Blockhouse?

A. We use some Blockhouse.

Q. It makes more gas than Pictou?

A. I think it does.

Q. The Lingan coal makes more gas than Pictou?

A. I don't believe there is much difference. I don't think the Lingan is as rich a coal as the Blockhouse.

Q. Is the Gowrie coal as good as the Blockhouse?

A. I don't think it is.

Q. I have had the quality of these coals given me by a person conversant with them, and he puts down Lingan at $4\frac{1}{2}$ feet to the pound; Blockhouse, $4\frac{1}{4}$ to $4\frac{1}{2}$; Gowrie, $4\frac{1}{4}$ to $4\frac{1}{2}$.

A. That is better results than we get, sir.

Q. Union, $4\frac{1}{4}$ to $4\frac{1}{2}$.

A. I don't know what the Union is.

Q. Sydney, $4\frac{1}{2}$.

A. Yes, sir.

Q. Pictou, $3\frac{1}{4}$ to $3\frac{1}{2}$.

A. You can get $3\frac{1}{2}$ out of Pictou easily enough.

Q. He says he knows of no reason why a person should use Pictou, excepting that it requires less purification than the other coal I have named.

A. I don't think Pictou contains so much sulphur as those others you have named.

Q. Are you acquainted with Westmoreland coal?

A. Yes, sir.

Q. That he puts down at $4\frac{1}{2}$ to $4\frac{3}{4}$.

A. Some people will make $4\frac{3}{4}$ feet of gas out of coal that others cannot get 4 out of.

TESTIMONY OF JESSE W. STARR.

Q. (by Mr. Jewell). Will you state what is your place of residence, of what firm you are a member, and what is the business of your firm?

A. I reside in Camden, N. J. — J. W. & J. F. Starr, — engaged in the iron foundry business. We manufacture cast-iron street mains for gas and water, and the manufacturing apparatus used about gas works generally, including the gas-holders.

Q. State whether or not your firm is one of the largest if not the largest firm in that department of production in the United States.

A. I believe we do more of that kind of work than any other concern that is engaged in the iron business.

Q. State whether you have or not constructed gas machinery all over the United States, and how extensively.

A. We have furnished a good deal of apparatus for the companies in the city of New York and Brooklyn. We have done a considerable amount of work for the Boston Co., at Baltimore, Norfolk, Savannah, Chicago, Toledo, Milwaukie, and some at Albany and Cincinnati, and some at Toronto, Canada.

Q. Will you state what is the comparative cost of erecting gas works, and furnishing gas machinery at the present time, as compared with what it was before the war?

A. The cost is somewhere about double what it was five or six years ago.

Q. Will you state the causes that have produced that result?

A. Well, the two principal causes are the increase in the cost of iron, and the increase in the cost of labor. Six or seven years ago, you could buy pig iron for about $20 or $22 a ton: we have now to pay from $45 to $50 a ton for pig iron. The wages of mechanics and laboring men both, are about double what they were six or seven years ago.

Q. How is it in regard to the price of coal that you use in your works?

A. Coal just at this time is not twice as high as it used to be. We used to get coal at from $3.00 to $3.50 a ton, delivered at our works; we have been able to buy some this season at from $5.50 to $6.00; but last year we had to pay as high as $10 and $11.

Q. Will you state at what price you could deliver gas mains of 48 inches in diameter, and what would be the proper weight of a gas main of 48 inches, of proper thickness?

A. Well, it would be required to be about seven-eighths of an inch in thickness; that is about as light as they can well be made and handled; and I think that thickness would weigh about 500 lbs. to the lineal foot, and would be worth about 3½ cents a foot.

Q. What would a main of 36 inches diameter cost?

A. That would weigh about 300 lbs. to the foot.

Q. And at what price could that be afforded?

A. The price would be about the same; about 3⅜ to 3½ cents.

Q. And a main of 24 inches?

A. 24 inches would weigh about 200 lbs., and the price would be about 3⅜ or 3½.

Cross-examined by Mr. Stackpole.

Q. How much was this a pound before the war, that you testify is now 3½ cents a pound?

A. That used to sell at about 1¾; from that to two cents.

Q. Was this common green sand casting?

A. The large pipe we make in dry sand, the smaller in green sand. These pipes, 24, 36, and 48 inches, would be made in dry sand.

Q. Dry sand is better than green sand?

A. Yes, sir; supposed to be.

Q. What was the price of ordinary green sand castings before the war?

A. Well, cast-iron water-pipes don't agree with the price of ordinary machine-castings; they are cheaper.

Q. What was the price of ordinary green sand castings?

A. Before the war, 2¾ to 3 cents.

Q. Now, what are they worth?

A. From 4½ to 6, according to the kind and the labor.

Q. You get less for your pipes?

A. Yes, sir. They are a staple kind of article, and made cheaper, and made by the piece.

Q. And in large masses?

A. Yes, sir. The men make them day after day, and by the piece, and are responsible if they lose them. Iron retorts cost just about double what they did before the war.

Q. Have you built any gas works?

A. I have built a number of gas works out and out.

Q. Does your testimony that they cost double what they did before the war apply to every portion of the works?

A. It applies more particularly to the iron part. I am not posted with regard to the other part.

Q. (by the Chairman). Do you expect that the price of iron will decline very materially under the resumption of specie payments, or before that time? Don't you look for a constant decline?

A. We have been looking for it a good while, but it hasn't come, and we don't pretend to make any calculations about it.

Q. (by Mr. Stackpole). It is not so high as it was?

A. No, iron is not so high as it was; but it is as high now as it was a year ago.

Q. The South Boston Iron Co. have been charging seven cents for their common green sand castings. Is that in accordance with your prices?

A. It is rather stiffer than we charge; but iron costs you more, and coal and labor cost you more.

Q. (by Mr. Jewell). Don't you apprehend there will be an increased tariff upon iron this year?

A. I don't pretend to say about that. I hope not.

Q. An increased tariff would of course increase the price of iron?

A. Of course.

Q. (by the Chairman). In your opinion, would there not be a decline in iron of fifty per cent if we were to resume specie payments within six months?

A. No, sir, I think not.

Q. Is it not your opinion that there may be a decline in merchandise generally, equal to fifty per cent?

A. I don't see how it can make a fall of fifty per cent, if it is regulated by the price of gold.

Q. The difference between a bank-note to day and silver is thirty per cent, is it not?

A. Yes; but that is not fifty.

Q. Then the effect of a resumption of specie payments on your reduced currency which you have afloat in the country now, which is between ten and twelve hundred millions, would be so great that there would be a natural decline in every thing, wouldn't there?

A. I am not financier enough to answer that.

Q. It is your expectation, I presume?

A. Well, we have been hoping for a good while that iron would come down to something near its old price, but we have been disappointed, and we are content to take things as they are now, from day to day. We don't take contracts anticipating a decline.

Q. (by Mr. Stevens). If a decline in the price of gold took place, would not gas come down in price, and other articles sold, just as much as articles manufactured from iron?

A. The price of iron at this time is regulated very much, I believe, by the price of gold and the importations; and I believe if the importations were entirely shut off, iron would be very much higher than it is.

Mr. JEWELL. Put us back to the old price of 1860, and we will furnish gas at $2.50 with the greatest pleasure.

TESTIMONY OF ESTES HOWE.

Q. (By Mr. Jewell). Will you state your business, and what if any experience you have had in gas manufacture?

A. I have been engaged for about fifteen years in the superintending of gas works, in connection with other business, so that my mind has been necessarily a good deal upon that, for I have had the control of the business.

Q. What present connection have you with gas production?

A. I am the Treasurer and Managing Agent of the Cambridge Gas Works, and have been from the first — for fifteen years. I am also a Director and President of the West Cambridge Gas Works, and a Director in the Malden Gas Works.

Q. You built the Cambridge Gas Works?

A. Yes, sir.

Q. What is the capital of that company?

A. $275,000.

Q. What is its annual production, as compared with the Boston Gas Light Company?

A. As far as I understand (and I believe I am pretty nearly accurate), it is about one-eighth part of that of Boston.

Q. With a capital of a little more than a quarter, you have about one-eighth of the production?

A. Yes, sir.

Q. What coals do you use in the production of your gas?

A. For the last five or six years I have used mainly the Cape Breton coals, with a certain proportion of Albert coal, which we use rather for a reserve, in case we get behindhand. We can make gas faster with it, and it is one of the things which we are obliged to keep on hand for that purpose; but I don't think we use it ten days in a year, certainly not a month in a year.

Q. You use it as a physician uses brandy, for a stimulant to a weak patient?

A. Yes, sir. It is like putting in pine knots when your gas gets low. The companies were in the habit of using rosin in the same way. When we could buy it for a dollar and a half a barrel, we would keep a few barrels on hand, and when we found our stock was getting low, we could hurry it up in that way.

Q. You are pretty largely interested in the mining of Cape Breton coals?

A. I am, sir.

Q. And that may have some influence in determining the question what kinds of coal you will use?

A. It is very possible it may.

Q. Do you know of any company in Massachusetts or elsewhere, — on the Atlantic slope of the United States, I mean, — which uses any Cannel or Albert coal, except, as you have said, as a re-enforcement in case of need?

A. I do not now. Although, of course, I am not thoroughly informed about every one of the companies, I do not know any one that is in the habit of using Cannel or Albert coal as a regular part of their charge. I think that has been given up, as people found they could get along without using it. When I used Pictou coal, I used the Cannel coal with it, because I thought we got better results from the mixture of the two.

Q. Are you acquainted with the Boston Gas Light Company's works?

A. Yes, sir. I have been there a great many times for information and instruction, from the first. I have made myself familiar with them, as I have with most of the large works in various cities I have happened to be in.

Q. You are acquainted with the works in New York and Philadelphia?

A. Yes, sir. I have examined the Manhattan Works several times, and the New York Gas Company's Works, the Philadelphia Works, the Cincinnati Works, the Halifax Works, and I have made myself familiar with the different modes practised in those various places.

Q. When did you last examine or visit the Boston Gas Company's Works?

A. Yesterday.

Q. Will you now state to the Commissioners what, in your opinion, those works, as to perfection of machinery — I mean, as a gas-making machine, in the whole?

A. Well, sir, ample and good. I heard what Mr. Roome said here to-night, and I should say, comparing the Boston works with those of the Manhattan Company, that what he said was exactly true; that the difference between them was, that the Manhattan Company have a good square lot of land, and have made new works on the East River. These are the works they show people. I have been to the old works and the new. They have got plenty of room, and have laid it out regularly with a view to very large works; consequently, it is a more symmetrical establishment. But I don't know of any thing in the relation of the parts of the Boston works to each other that should in any way make it more expensive to manufacture gas there than it would be in perfectly symmetrical works. The want of symmetry in the works is more apparent on the side of the buildings between Hull Street, and Commercial Street, and the retort houses seem to be rather huddled together; but when you come to the economy of the thing, the only question that could be affected in any way by that arrangement, economically, would be simply the question whether it was a little more or less convenient to get the coal to the mouth of the retorts. The work done at the mouth of the retort is done just as well in one place as another. Gas-making can be carried on just as well on a triangular lot as upon a perfectly square one. The relations of these parts are all just as good, mechanically. It is not at all as it would be in a manufacturing establishment, where you had complicated shafting to carry round to a variety of places. The only thing in which I could see that that want of symmetry could affect the Boston Gas Works in point of economy would be simply the matter of hauling the coal to the retorts; and I don't think an estimate of that amount could be stated in figures upon the price of a thousand feet of gas.

Q. Then, as a machine for the manufacture of gas, you would regard the Boston Gas Company's Works, as a whole, as perfect as the Manhattan Company's, or any other company's that you know of?

A. There is one thing I will say about the Boston Works, wherein they are a little different from any very large works. I think they are the only large works in the country that are using wet lime for purification. They use both wet and dry; and I will say this, that I never saw anywhere more perfect purification than I saw there. The wet lime apparatus is entirely adequate, as

the tests prove, to purify the quantity of gas that they are now making. It is afterwards passed through the dry lime, which takes out certain matters, particularly carbonic acid, that are not removed fully by the wet lime. It is, in short, a double purification; and the only criticism I should make upon it is, that it cost a great deal of money to put it up; but being there, it does not cost so much in time or labor as it would the other way.

Q. So the Boston gas is purified both by wet and dry purification?

A. Yes, sir.

Q. And the result of the wet purification alone, as I understand you, was good?

A. Very good, sir.

Q. And both lead to as perfect purification as you ever saw, I think you said?

A. Yes, sir, I never saw any better purification anywhere.

Q. Take the retorts. You saw them in operation, — saw them charged and discharged?

A. Yes, sir, I have seen them a great many times before. It is no new thing to me; I am a frequent visitor there.

Q. How was the carbonization of the gas?

A. The coke came out of the retorts in the proper condition. It was purged of its inflammable parts. All the volatile part had been driven off, and very good coke was drawn out. The heats were very even; and this is a very important matter, and it requires very steady supervision to keep the men up to the work of keeping every part of the retorts equally hot. It is one of the difficult things and shows good management, and that the erections are well arranged in regard to drafts, that they are able to keep such equal heats.

Q. Were not the heats remarkably equal from front to rear of the retorts?

A. They were.

Q. Were all the retorts you saw of an equal heat?

A. Yes, sir, remarkably.

Q. Was not that a pretty moderate degree of heat?

A. Yes, sir. It was cherry red heat only.

Q. Will you state the coals that were used to charge the retorts?

A. The coal that was being used yesterday was a mixture of Pictou, Cape Breton, and Albert.

Q. Did you see the tickets, or learn what the usual mixture was?

A. I asked the Superintendent, Mr. Giles, and he told me that 7½ per cent of Albert was used, and the other was an equal mixture of Lingan, which is one of the Cape Breton coals, and Pictou.

Q. Is the Boston Gas Company the only company within your knowledge on the Atlantic coast that uses the Albert coal as a regular gas producer?

A. I am not aware that any other company is now using it.

Q. You saw the Albert coal put into the retorts and being used?

A. Yes, sir; the coal was there, going in, and a very large stock on hand — four or five thousand tons, I should say; the largest pile I ever saw.

Q. Will you state what is the quality of the Boston Gas Light Company's gas?

A. Judging entirely by my eye, I call it very good.

Q. State whether or not it is equal or superior to the gas made by any other company you know of.

A. I don't know any other company that makes any better gas.

Q. Must not the gas necessarily be of a better quality, inasmuch as the Albert coal is used?

A. That gives it a higher illuminating power, undoubtedly.

Q. Your production, I think, is about an eighth of the Boston production. What do you charge in Cambridge?

A. $1.00 and the tax.

Q. In all, $1.25?

A. $1.20. The tax is a little less with us than in Boston.

Q. $1.00 net?

A. Yes, sir.

Q. The Boston price is $3.00 net?

A. Yes, sir, so I understand.

Q. What are the prices of other gas companies in the neighborhood, as far as you know?

A. They range from $3.50 to $5.00 net, as far as I am acquainted.

Q. Is there any gas except Boston gas that is sold lower than $3.50 net, to your knowledge in Massachusetts?

A. I don't know of any.

Q. Do you know of any gas anywhere that is sold for less than

$3.50 net, except the Boston gas, unless it may be the Philadelphia gas?

A. I think the Philadelphia and Pittsburg gas is sold for less than that.

Q. I am speaking of the Atlantic cities only.

A. No, I don't. I have not examined upon that point lately. I know that there has been a general advance in price since 1862.

Q. State whether or not, in your opinion, the Boston Gas Light Co. can make and sell gas, using the coals which you saw used, at a less price than $3.00 a thousand net, and earn dividends.

A. Well, sir, if they are to get any thing for their capital invested, I shouldn't think they could.

Q. Will you explain the change in prices of coal since the commencement of the war?

A. In 1859, my coal cost me $4.90; in 1860 and 1861, it cost me $4.70; in 1864, it cost $13.20; in 1865, it cost $8.90; and this year, about $8.75.

Q. That is, the Cape Breton coals that you mean?

A. Yes, sir; the Cape Breton coals. That is the cost. I have bought the coal at the mines, from the General Mining Association, and paid the freight on it, and had it delivered at my works. Of course those payments are made now in gold; they have always been made in gold.

Q. Are the values you have given currency values?

A. Currency values; those are the currency cost.

Q. Does that include any thing for wharfage and storage?

A. That is the charge for delivery on the wharf to my men.

Q. But does not include the cost of putting it on the wharf and putting it into the store-house?

A. The price of freight always includes the stevedore's fees for discharging the coal, and if you do that yourself, you get a drawback from the freight. That is the price of coal delivered at my wharf.

Q. Before the war, your price for gas was $3.00?

A. Yes, sir.

Q. You have raised in the same proportion as the Boston Gas Light Co. — 33 per cent?

A. We have raised to $4.00.

Q. State, Doctor, whether, with the present prices of coals, you

are able to make as much, or any more profit, at $4.00, than you used to make at $3.00?

A. I had got my stock in such condition that I thought I could make 8 per cent fairly, and expected to. When this rise in prices took place, I left the price at the same figure until I found I was not getting my expenses and a dividend, and then the price was raised, at first to $3.50, and then to $4.00. We have been able, under that advance, to keep the dividends at six per cent. We have not divided, for two years, any more than six per cent. A part of the time, we haven't earned six per cent. We only lapped over, thinking that we might manage to get through; and when we earned only two per cent, we have divided three, and tried to make it up. That is the honest truth about it. One year we didn't make five per cent, and divided six, because we were pretty sure that out of old reserves and other things we should be able to make it up.

Q. In your opinion, can the Boston Gas Co., at present prices, make as much money as at the old prices, when they got $2.25 for their gas?

A. That is a question into which so many elements enter that I cannot give an off-hand answer. The whole question of increase of consumption, and all the items of expense and cost, would have to enter into it. Almost all the companies in this country are in this situation in regard to their consumption, — it is steadily increasing, from natural causes. That implies a constant increase in the plant which they are using. That in itself, when they are doing well, is considered rather a benefit. If you have got an investment that is paying eight per cent, you are very willing to increase it, in other words. But in the present state of prices, I think that nobody is very desirous of largely increasing his investment of capital. And I notice this with regard to the Boston Gas Works, that they have been compelled, at this present time of high prices, to put up one large gas-holder, and I understand contemplate putting up another. I look upon that increase, therefore, at this time, as rather a burden than any benefit to them, because it compels them to invest capital at a very unfortunate time.

Q. Are you sufficiently familiar with the cost of erecting gas works to be able to give an opinion as to the comparative cost of erecting gas works now, and six or seven years ago?

A. What Mr. Starr stated is exactly in conformity with my experience. He is a builder; I am only a man who deals with him

sometimes; at least, I have done so, to my great satisfaction. He is the largest and best builder of gas works in this country. Iron, in all its shapes and forms, costs us just about double now what it did before the war; and that is a thing that enters very largely into the cost of the production of gas. Nobody will estimate the life of a bench of retorts longer than a year. That costs a large sum of money. A new bench of five clay retorts to-day will cost a thousand dollars, and you will burn it up in a year, and the greater part of it is gone; you have nothing left but the standing pipes and the means of carrying the gas off. You have got to tear it down and rebuild. Now, you burn that up just as certainly as the coal. You double the price of that, and you increase the cost of the production of the gas to that extent. That is only one of the items in the expense of building the works; it is only one of the things that you have got constantly to renew and charge to the cost of making the gas. What Mr. Starr said is true in regard to building works, — there is not an item that has not substantially doubled, from the first piece of iron, or first brick, up to the most highly finished article that you use, — your photometer, if you please. I believe all these things are doubled in price, but there are certain parts that have more than doubled. I think Mr. Starr will not build a gas-holder, which is formed of wrought iron that has gone through several processes, and been taxed several times, for less than 125 per cent advance upon what he would build one before the war. This is a very large item of expense in a work.

Q. Labor is 75 or 100 per cent in advance of what it was before the war, is it not?

A. Well, sir, the coarsest labor is about 75 per cent higher; skilled labor is double; and we have to use a great deal of skilled labor in making gas, — very expensive labor.

Q. What, in your judgment, would be the probable expense of building works sufficient to supply the city of Boston; that is, works of the capacity of the present Boston Gas Light Co.'s works, taking into contemplation, at the same time, the probable increase which you have to provide for?

A. That is a matter that would require a plan. I know this very certainly, — that the Boston Gas Works could not be duplicated without a very large advance on what they cost originally. Probably, taking the whole range, it would be from 80 to 100 per cent advance on what the works actually cost. I don't know whether their capital stock represents the whole cost of the works

or not, of my own knowledge, but I have been told that it stands very much less than the actual cost of the works.

Q. Then, in your opinion, the capital being $1,250,000, to duplicate those works would cost two and a half millions or more at the present time?

A. I have no doubt it would. At least, I shouldn't like to undertake it, even for that.

Q. Take one item. We have, within a hundred or two of 16,000 meters set. What would the mere item of meters cost to-day?

A. $250,000, at least.

Q. Then there is the supply pipe for those meters, to take a small item?

A. That would cost you about $80,000.

Q. About $5.00 a pipe?

A. Not far from that.

Q. You have in former times — I think six or eight years ago — had in contemplation, with other gentlemen, the erection of works to supply part of the city of Boston?

A. I was invited to take part in the Shawmut Gas Co. if it should be authorized, and I looked into the matter with some care.

Q. Did you and your associates examine localities to see where gas works might be built about Boston?

A. Yes, sir. I cannot say that I made any personal examination, except of one particular piece of property. I went to see one piece of property, that it was understood the city was willing to sell for that purpose. That was up where the hospital is now.

Q. The city declined to sell for that purpose?

A. Yes, sir.

Q. Will you state whether, in your judgment, there is any place without Boston, within a range of four, five, or six miles, where gas works suitable for the city of Boston could be built? If so, where?

A. There are plenty of places, if people would let you build them; but I take it if the city of Boston won't tolerate them in their limits, a neighboring city cannot be expected to take the gas works into their limits. I am very confident that would be the answer in Cambridge. You would be told, "If you don't like the gas works in Boston, we shall not like them any better here, and we sha'n't let you come here." I think that would be the general answer in all the suburban cities. There are several con-

siderations to be taken into account. You want to get as near your consumption as possible. Every additional foot of gas pipe is not only a great expense, because it must be of large size, but it also affords a large surface and a large opportunity for wastage by leakage and condensation; so that proximity to the consumption is a matter of great importance, and I don't think anybody would go, voluntarily, any farther from his point of consumption than was absolutely necessary. That, therefore, would be the limit. If the city of Boston had determined that the gas works should not be in a part of the city that is in any way incommoded by them, I don't know any other place they could go to, within the city proper, than down to Breed's Island. I believe that is part of the city.

Q. You wouldn't think of building works at Breed's Island, and carrying your pipes over two or three streams?

A. Perfectly practicable, if you have got the money.

Q. You heard Mr. Starr's and Col. Roome's testimony this evening on the subject of the cost of mains. Would it be safe or prudent, in your judgment, to build works with a main of less than 48 inches for the supply of Boston?

A. The question of how large a pipe you want is controlled, of course, in the first place, by the quantity you want to deliver, and in the second, by the distance which you have got to pass the gas through. If you are coming from a place so remote as Breed's Island, you must have a much larger pipe than you would need if you were nearer. But that is a matter to be calculated by the tables. It would be necessary, in order to supply the city through a single main, to be able to deliver within an hour about one-quarter part of the whole consumption of the day, — the maximum consumption of the day. For instance, here in Boston, the maximum consumption approaches 1,800,000 feet. It would not be sufficient, then, to meet the wants of the public of Boston to-day to take a pipe that was capable of delivering less than 500,000 feet in an hour. That would be a quarter part of their two millions, and that does not provide for any increase. Now, what size pipe is necessary to deliver that gas depends upon the distance from which you wish to bring it, and the pressure under which you bring it. The velocity of the gas will be doubled as the square of the pressure. That is, if you want to double the velocity of the quantity of gas delivered, you must quadruple the pressure.

Q. You would not consider it a practicable thing to build works on Breed's Island, would you?

A. I say it is perfectly practicable, because it is a mere question of dollars and cents; but when you come to the question of bringing half a million feet of gas in an hour, such a distance as that, it is a pretty large problem.

Q. And the expense of mains would have to be added to the other estimate of cost?

A. Of course, that would have to be added, and it would not in any way diminish the necessity for gas holders. Some people seem to think that they would get rid of gas holders in that way: but you must have gas holders. You have got to have gas on hand, because you cannot make it fast enough. You have got to have gas ready to deliver; and the economy of the present arrangement of the Boston Gas Co. is, that the gas holders, instead of being clustered round the gas works, are scattered about, giving about an equal pressure through moderate sized and comparatively cheap mains. You could get the same pressure by having large mains, and having the gas holders at the works; but you must have gas holders, because the gas must be made in 24 hours, and used in 6.

Q. You are able to judge whether the system in Boston is a wise, prudent, and economical one?

A. It is precisely the system, so far as the equalization of the pressure is concerned, that I think would be decided by any mechanic to be the best practicable.

Q. It is substantially the same system you have adopted at Cambridge?

A. We have been compelled to adopt the same there. We have 36 miles of pipes, and a comparatively sparse population. We have to have detached gas holders. The same system is adopted at Charlestown for the same reason, — to equalize the pressure.

Q. Would any wise and prudent engineer put all his reservoirs at one end of the pipe, when he had the means of distributing them about, and so providing against accident?

A. I should think he was "putting too many eggs in one basket," to use the common proverb that everybody understands.

Q. That is provided against in Philadelphia by the different works established there?

A. Yes, sir; there are seven or eight different companies.

They have different centres of manufacture. They have not discarded any of their works, as I understand it.

Q. So that, if their main works should fail, they would be able to supply the gas from the smaller works, by increasing the production?

A. Their new works are at Point Breeze, which is two or three miles below the old works, on the Schuylkill, and a convenient point to receive large vessels with foreign coal, which is a very valuable element in cheapening the cost, and down in a part of the territory towards which the city is growing all the time.

Q. (by the Chairman). You say that the quantity of Albert coal you saw mixed with the other coal at the Boston Gas Works, was about seven per cent?

A. Seven and one-half per cent I said was the quantity, as I was informed.

Q. That was put in, in order to make the gas better?

A. Yes, sir.

Q. What greater quantity of Albert coal could be added to make the gas still better, and have it burn without inconvenience from smoking?

A. I don't think you could put in much more than ten per cent without getting a production of smoking gas.

Q. If Cannel coal was as cheap as any other kind of coal, wouldn't you use all Cannel coal?

A. I think very likely I should.

Q. Wouldn't you make a very much richer gas?

A. Undoubtedly; it is much richer than the other.

Q. Wouldn't that make it much cheaper to the consumer?

A. That depends upon the price we were compelled to charge for it, by the price of the article.

Q. If it was as cheap as any other coal?

A. Certainly. Undoubtedly, this whole question turns upon the question of what gold and silver would buy. Cannel coal is not so plenty as other coal, and therefore it is a higher price, and is likely to remain so.

Q. The reason you charge a higher price than the Boston Co. is because you are not so compact?

A. Yes, sir.

Q. You could supply it much cheaper if you were as compact as Boston is?

A. I have no doubt we could, sir.

Q. What kind of coal do you use?

A. We use almost entirely the Cape Breton coals.

Q. Do you make any mixture?

A. Usually, not at all. We have tried various kinds of Cape Breton coal. There are four or five different qualities of coal, that are very nearly the same article. We have tried them all, and there is no material difference between them.

Q. Don't you know that the reason why there are various gas works in the city of Philadelphia is because they had to buy out the various companies?

A. Yes, sir.

Q. They were not built there from necessity in order to supply the city with gas?

A. No, sir.

Q. They could supply the city without them?

A. Undoubtedly. Still, I think if the Point Breeze works were the only point of supply for the city of Philadelphia, you would find that they would require large gas-holders in the Northern Liberties, Frankford, and all that region.

Q. Would there be any necessity for gas-holders, if their pipes were sufficiently large?

A. I think they would find, under any circumstances, that that was their true economy. They might adopt the plan you mention. The result would be, their consumption would increase, their pressure would fall off in those remote parts, and they would see that the best thing would be to put up gas-holders in those remote parts, and they would do it.

Q. In New York, don't they have their gas-holders in the yard of the works?

A. Yes, sir. But then the Manhattan Gas Co. found it necessary, when they wanted to increase their works, to go into another place, so that they have two entirely distinct works; and I think — I am not certain — that they have put up a third, with a view of getting not only their gas-holders at various places, but the actual points of manufacture at different parts round the circle, instead of getting their gas from one side of the circle to the other.

Q. Didn't they do that in order to obtain other parts of the city to light?

A. I think that matter has been settled between the companies. I don't think the districts have been changed lately.

Q. Do you know that they started a Citizens' Co. in Brooklyn?

A. I have seen it mentioned, and seen the stock quoted in the papers.

Q. When they started, didn't they sell their gas at a very much less price than the old company?

A. I believe they did, sir. I think both companies sold it for less than cost for a year or two.

Q. Are you aware that they formed an alliance and divided the city, and agreed on one price?

A. I am aware that the difficulty seems to be ended, for the stock of the Citizens' Co. is worth something now; it wasn't at first, I am told, — I don't know any thing personally about it, — I am told that they have made an alliance. It is always the case. I never knew an instance where two capitals were put together in that way, where they were not compelled by the instinct of self-preservation to make an arrangement. You may make as many arrangements as you please, one of two things will happen, either the competition continues until one or both companies are ruined, and then the old company buys up the other, or, before ruin comes, they make a combination. That is human nature; it is the law of the struggle for life that Prof. Darwin speaks of.

Q. Are you aware that there was a Mutual Gas Co. chartered for the city of New York by their Legislature last winter?

A. I never heard of it, sir.

Q. When you were an applicant for a charter in this city, you were opposed by Mr. Jewell as counsel for the Boston Gas Light Company?

A. I never was an applicant for a charter.

Q. Were you not associated with others who were?

A. No, sir. There were two charters granted, and an application was made to your Honorable Board for leave to open the streets, and a petition was offered, as I understood at the time, for leave to purchase a piece of land. Great objection was made to it, and finally leave was not granted to open the streets. That was what became of that. The charters of those two companies have never been repealed, but I suppose have become dead under the General Statutes. I will say that, so far as I had any interest in it, it was simply for the purpose of making money honestly and legitimately, by going into an enterprise that might be made productive in the new part of the city of Boston. I was ruled out, and did not go into it.

Q. You were opposed by the existing Gas Light Co.?

A. Of course. I expected to be. I should have opposed them under the same circumstances.

Q. Did you make a declaration of what you would sell gas for?

A. I think the parties offered to sell gas at $2.25. That was at a time when the Boston Gas Co. was laying in its Pictou and Provincial coals at $4.25 a ton, which is not half what it costs now.

Q. Didn't you say you would furnish it for $1.50, if you could have a charter for 20 years?

A. I don't think any such thing was said; certainly, it never was by me. I never saw the figures from which we could do it.

Q. Was it not said by your associates?

A. I think not. I wish you to understand, however, that I did not go personally before the Committee, and don't know what was said. I only know I was invited to take an interest, and should probably have done so, if the works had gone on.

Q. (by Mr. Hills). In your opinion, would Pine Island, near Roxbury, be a suitable location?

A. I think that was the locality that the Shawmut Co. selected, when they found that they could not buy a piece within the city. But they did not proceed there. They had two obstacles; one was, that the Mayor and Aldermen of Roxbury would not allow them to open the streets; and another was, that the Mayor and Aldermen of Boston would not allow them to open the streets; so that, as they could not go in the air, they had to give it up. It was considered by the parties interested, in consultation at that time, a much less eligible point than a point lower down on the South Bay; but it was thought that the coal could be got there in small vessels coming up the South Bay, as they came up towards Roxbury, to those small wharves there in Roxbury. In that position, undoubtedly, works can be built, if the city of Roxbury will let the city of Boston come and make smells there that they are not willing to smell themselves.

Q. Would there be any objection in a sanitary point of view?

A. As regards the question of the sanitary effect of gas, I am bound to say that the testimony is very strongly in favor of gas works being wholesome; and it has been rather a puzzle to know why it is so. It is a fact that during the awful cholera in London, none of the men engaged in the manufacture of gas in the large gas works were affected by it. There has recently been a matter

brought out by scientific investigation that perhaps affords a clew to it. Among the forty thousand things that come out of coal when it is distilled, is carbonic acid; and Prof. Gibbs, of Cambridge, has recommended, as the result of some experiments made in the army, that carbonic acid should be used as a disinfectant in hospitals. It was extensively used by the Sanitary Commission, and was found very efficient; and I suppose that the real reason why the gas works seemed to have that protecting effect upon the men was, that there is developed in the residuary products of the gas, all this carbonic acid, which is said to produce ozone in the air, which is one of the elements very essential to human life and its healthful condition, and it is an element that is said to be absent from the air when miasmatic fever prevails. I suppose if there is any truth in the theory, — and the men themselves and the observers, all hold to it, — it arises from that fact. There is a scientific solution of the fact. There is also another thing. The ammoniacal exhalations, which are so annoying, are extremely wholesome. The ammoniacal gas that escapes is almost suffocating, but it has been prescribed for a number of years by Dr. Wyman for people having the whooping-cough. I constantly find hard cases of whooping-cough standing round our works, smelling this sharp, strong smell of ammonia, which is very wholesome. I only mention this to show that a very bad smell may be connected with nothing hygienically objectionable. And I believe there is no disease that has grown up among gas-makers. Almost all employments where the skin is irritated, or where the lungs are subjected to odors or dust, or any thing of that kind, have a specific disease which prevails among the men more or less. I have never heard of any thing of the kind among gas-makers. We have the baker's itch and the grocer's itch, and there are certain forms of asthma that belong to other trades; and there are certain skin difficulties that men get in woollen factories, in consequence of the bad oil. I have never heard of any thing of the kind among gas-makers.

Q. (by the Chairman). Do you set apart any portion of your works for a hospital?

A. There is a large place where they can go and get as much of this ammoniacal smell as they please, during the time it is given off.

Q. If you were out of health, you would make your residence in a gas-house?

A. It would depend upon what my difficulty was.

Q. What amount of gas do you burn on your streets?

A. Four feet an hour. That is our contract. I had occasion to make an examination of our accounts, and thinking that we were losing a large amount by leakage, I made an investigation, and found we were really furnishing about five feet an hour at that time. That was owing to the fact that the burners had got old, and we had to change them. They are burning now four feet, as near as we can measure.

Q. What burner do you use?

A. The lava-tip bat-wing burner.

Q. Whose make?

A. I can't tell you the name. We don't put them on. The city pay the expenses. They light and extinguish the lamps, and keep them in order.

Q. (by Mr. Davies). What distance apart do you place the lamps in the street?

A. I think the ordinance says they shall not be less than 300 feet from each other. We have comparatively very few lamps. We have no lamp-posts except those put up by private citizens. A man petitions for the privilege of putting up a lamp-post, and if his petition is granted, he puts it up at his own expense, and the city agrees to light it. When a lamp-post is put up, they pay the Company for the gas, and their own men light and extinguish and keep the lamps in order.

Q. (by Mr. Hills). In case the works are located at Pine Island, would it be practicable to have the gas-holders located there?

A. It would depend upon how much land you could get. I presume you could get a piece of land large enough. I am not acquainted with the locality.

Q. (by Mr. Stevens). You are acquainted with the gas engineers of the country?

A. Generally.

Q. You know who are the best engineers?

A. I don't know but the men that a Gas Company would go to would be rather suspected.

Q. You know the reputation of Col. Roome?

A. Col. Roome stands very high.

Q. One of the highest?

A. Yes, sir.

Q. Any statement he makes should be received with credit?

A. Col. Roome and Mr. Adam of the New York Company are the men with whom all New York and all Western New England consult. They are extremely obliging in giving information to smaller companies, and smaller companies are obliged to rely for a great many items of experience upon the larger ones.

Q. Do you know any gas engineer of any repute by the name of Salisbury?

A. I never heard of him.

Q. You would have been likely to have heard of him, if he had been of any real repute?

A. I think it likely I should.

Adjourned to Saturday evening, at 7 o'clock.

SATURDAY, Dec. 15.

The Committee met according to adjournment. Mr. Stackpole said, that, before any witness was called, he would like to inquire if this was to be the last meeting of the Committee, as had been previously stated.

THE CHAIRMAN. I do not see how the Committee can give any more time, in view of the near approach of the first of January, and the fact that the members of the Board of Aldermen have the reports of their Committees to prepare, and are very much pressed for time. I do not speak for the Committee now, but it seems to me that the question has been exhausted here, and that the matter can now be brought to a close.

Mr. JEWELL. We have attended here for seven evenings to hear the testimony which was introduced by Mr. Stackpole, and we have occupied, in putting in our testimony, two evenings.

Mr. STACKPOLE. You had nearly one evening when Mr. Blake was examined.

Mr. JEWELL. We had part of an evening in examining Mr. Blake, it is true, so that we have had two evenings and part of another. There have been seven evenings occupied in the presentation of testimony against us, and we ask that there shall be sufficient time allowed us to put in what we believe we ought to put in, in order that our case may go properly before the City

Government and the people. I want very much, as you know, Mr. Chairman, to get away at an early hour this evening — by 9 o'clock, if possible; and I think, as it is Saturday night, we ought to adjourn by 9 o'clock. We shall not be able to examine Mr. Greenough to-night, because there is enough testimony to occupy the time until that hour, certainly. Then we desire, after the testimony is in, to make an address to the Committee on the subject they have had under consideration here; to examine this testimony, and state what we understand to be its result; and generally, to express the views which we think we ought to express to have this subject properly considered. We find that the report of the evidence which has been taken in this case is being printed by the city. We supposed that not only the evidence, but the whole report, as made by the phonographer, would be printed, including the testimony taken last spring; but we find that only the testimony taken this fall is to be embraced in the printed record. We had supposed that the testimony of Prof. Rogers would be printed, and therefore did not propose to call him; and also what was said about the inspection of meters, about which nothing comparatively has been said here. We have read over the testimony taken last spring, and the statements of the counsel for the South Boston Company (George Putnam, Jr., Esq.) with which we are satisfied, and we desired that those statements and that testimony should appear with the rest; and we think our rights will be very much prejudiced if they do not appear in this report, which is to be made to the City Government. If they are not printed, then we must call Prof. Rogers, and go over all that ground again.

The CHAIRMAN. That is all before the Committee, and will be considered by them.

Mr. JEWELL. That may be so; but let me ask why this is printed. It is printed not for the use of the Committee, but for some other purpose.

Mr. HYDE. As I understand the matter of printing, it was done for the use of the Committee, in order that the members of the Committee who were absent (as it was suggested we could not all be present at every session) might have an opportunity to read the testimony.

Mr. STACKPOLE. With regard to the objection, that Mr. Putnam's statements are not to be printed, I do not see why they should be. He did not testify; he merely stated certain facts that

he intended to prove. I notice that my remarks are not printed, and I think they are very properly omitted. I do not see why they should be printed; I do not see that they would be of any use. They would merely take up time; and so would Mr. Putnam's. As for Prof. Rogers, his statement was *ex parte* merely. He made a partial statement only, and he began here over again.

Now, in regard to the statement that the company have not had sufficient time. They certainly had one evening pretty much, if not entirely, devoted to Mr. Blake, and they were notified, some time before, that on another evening, in consequence of the absence of our witnesses, they would have an opportunity to put in testimony. They did not choose to do so, and the Committee were obliged to adjourn before nine o'clock. It is also to be noticed, that on those evenings when they have put in testimony, the Committee have sat until eleven o'clock. I think they have had nearly as many hours as the other side.

So far as the matter of arguments is concerned, that is entirely with the Committee. I had supposed that the matter had been so fully investigated, that no arguments, on the one side or the other, would be needed; and I supposed that the time was so short, that the counsel would prefer to submit the testimony of experts, and people conversant with this subject, rather than take up time by talking about it themselves. It seems to me, that, in order to give the Committee time to report, we ought to sit as long as possible this evening, and conclude the hearing. I do not wish to press the gentlemen on the other side, but there are two counsel, and Mr. Greenough is here to advise. My judgment would be to adjourn this evening for good; but if we do not, I hope the adjournment will be to Monday evening, and that we shall then close the hearing.

Mr. JEWELL. It does not seem possible, and I did not suppose it was expected by anybody, that this Committee were going to report any bill or ordinance or any thing on this subject that could pass the present City Government. I do not see how it is possible, between the 15th of December and the new year, to mature and put through the City Government any proper ordinance on this subject. I supposed this evidence was printed for the use of the next City Government, when possibly this matter may come up again. But, more than that, we think it is our right — we think we should fail to do our duty to the Boston Gas

Light Co. who employ us, if we did not state the views which that Company entertain upon this subject, and examine and discuss this testimony. We think we are entitled to have an opportunity to address the Committee, and that our argument should go into the regular proceedings; so that, when they are referred to hereafter, the positions we take and the evidence we think applicable to this case may be understood, and that, generally, our views in regard to this matter may go before the public with the evidence.

Mr. STACKPOLE. It seems to me that if this thing is put over, the result will be just as the gentleman says, — it will be so late, that the present City Government will take no action in the matter; and it seems to me that the views of the learned counsel on the other side are favored by all this delay. It was announced, more than ten days ago, that the Committee would not sit beyond last week; then another week was allowed, and it was clearly announced, a week ago, that the Committee would not sit beyond this week. It seems to me that this is a motion for delay, and that if it prevails, the object of the other side, that this City Government shall not take any action on the subject, will be accomplished. It seems to me that the object is merely to prevent the Committee from reporting to the whole City Government their action, and the conclusions at which they have arrived. In my judgment, it will be found, if further indulgence is shown, if the thing is allowed to go further, that the effect will be, just as the gentleman says, to put off the whole matter. So far as I am personally concerned, it makes no difference to me; but, being retained, as I understand, as counsel for the Committee, to have this matter properly attended to by the present City Government, I feel it my duty to object, and to urge, with all the power I can, that this hearing may be brought to a close, that the City Government may take such action as they shall think the testimony in the case requires; and I feel very strongly, that if this thing is allowed to go over, it will oust the present City Government of their power over the matter, will entirely defeat any action that this Committee may take upon the bill, and the whole thing will go over, — and that, I suppose, is what the other side want.

Mr. JEWELL. The gentleman entirely mistakes the position of the Boston Gas Light Company. We did not fix the time when this hearing should commence this autumn; it was fixed entirely

by the Committee; or by the gentleman who just addressed the Committee.

Mr. STACKPOLE. Not by me at all.

Mr. JEWELL. However that may be, we did not fix the time for this hearing, — we did not commence it; we have not asked for any delay, and we do not propose to. All we ask is, what we asked at the beginning, that the Committee shall sit here and hear all the charges that can be made, from beginning to end, against the Boston Gas Light Company, and then have the patience to sit here while we refute those charges, whatever they may be; and then we ask that the whole matter may go before the people. The gentleman says we are asking for delay. We do not want any delay. We are ready to sit here day after day, night after night, and hour after hour, as long as the Committee choose to sit; but we do ask that the Committee shall sit until we get through, after they have sat here and heard all that is to be said against us. This is a public question. It is not a question that concerns merely the Boston Gas Light Company. This corporation has certain public functions to perform, and it has been striving for forty years to perform them faithfully and honorably. We think we owe it to the officers of the corporation and to the stockholders to demonstrate to the people that they have not been misused for the last forty years; to show that instead of being an odious monopoly, it is a beneficent monopoly, — that it has used its power for the benefit of the city, not to injure it. I have taken the same position before a Committee of the Legislature, which sat two years ago, and I demonstrated, as I thought (certainly the Committee thought so), that this Gas Company was not an odious monopoly, but that it had, from first to last, done its work well, — better than any other company in any Atlantic city of the United States; furnished a better quality of gas, and furnished it cheaper than it was furnished to any other Atlantic city; and I ask to be allowed to show that here, — to justify ourselves; and then I ask that our justification may go to the people, who have got to pass on this question. Why, sir, the Boston Gas Light Company, from beginning to end, has done nothing to hinder this examination; they want to do nothing to hinder it. Whenever there is an investigation, they are glad to avail themselves of it, because they want to show, by such proofs as they know are within their power, that they have used the functions that the State has delegated to them in such a manner as consists

entirely with the interests and welfare of the people of the city of Boston; and we desire, when this document goes to the people, that our side of the question shall go to them, that they may understand all we have to say upon the subject. We are sorry that it has got to be so near the end of the year. That is our misfortune; it is the misfortune of this question. We wish this whole matter discussed in the light of this evidence. I should like to know, Mr. Chairman, how the gentleman on your right [Mr. Hyde] can make up any report or opinion on this evidence? He has not heard it, and he has had no opportunity to read it. It has been in manuscript up to this time, and cannot be printed for four or five days to come. Some of the members of the Committee have not heard the testimony, and have not seen the manuscript.

Now, how can any Committee report on testimony that they have not heard or read? All we ask is fair play. We ask that we may have an opportunity to show how just the corporation we represent is; how beneficent its operation has been; how reasonable its prices are; how moderate its dividends, in proportion to the actual investment of property used; and how well the citizens have been supplied with gas for forty years; and then we desire to ask the Committee and the citizens, after they have heard the whole case, whether they believe anybody could do this duty any better than the Boston Gas Light Company have done it.

THE CHAIRMAN. I will state, in reference to this matter, that when the Committee came together upon this subject, they never dreamed of any such thing as counsel on their part, or of hearing counsel on the part of the Boston Gas Light Company. They never considered or thought of the investigation in the light in which it has gone on. They regarded the questions to be considered as simply whether the city of Boston should have, as they have in London, an Inspector of Gas and Gas Meters, and whether it would be for the interest of the city to build gas works at a distance from the city and supply the citizens with gas at the minimum cost. These questions did not touch the question how well or how poorly the Boston Gas Light Company had conducted their business, or how good or how poor gas they had made. As evidence that we never thought of having counsel here, we proceeded two evenings without counsel, while the Gas Company presented themselves here with counsel, and asked that they might be heard.

In reference to this matter of printing, I will say, that I was not so much in favor of it as other members of the Committee; and after the Committee voted that they would print, I consulted with Mr. Bugbee in regard to the matter, and he said it would cost a great deal of money to print the evidence as it had been reported, word for word, and as it required an appropriation from the City Government to print, I was in great doubt whether we should print, or simply take the manuscripts furnished to each of the parties, and be guided by them. The printing was delayed for some time and has not been commenced until within a few days; and after talking still further with different members of the Committee in regard to the matter of printing, and the extent of it, it was decided that, as we started the investigation this fall *de novo*, and it was so announced, we would go on and print from that time. In this view of the matter, Mr. Bugbee thought it was of no particular consequence whether the testimony taken last spring was printed or not, and as it would add considerably to the expense, at his suggestion, that portion of the investigation was left out; but with no intention of leaving out any thing that would be of advantage to the Gas Company. The thing was not talked of by any member of the Committee, or even thought of. It was simply left out to reduce the cost of printing, which would be a very important item. The character of the evidence given last spring was talked over, and as a great deal of it relates to meters, a very common subject of investigation, and one on which a great many books have been published, with all manner of diagrams of all sorts of meters, which books are accessible to any person in almost every library or bookstore in Boston, that was considered a matter of no very great importance, and hence it was left out.

Mr. HYDE. I have not been able to attend all the meetings of the Committee. On one or two occasions, I was misinformed in regard to the evening of the meeting, and on one or two other occasions, I was unable to attend, on account of other engagements. The Committee have spent a good deal of time in hearing testimony for the city, and it seems to me we ought to be willing to allow, as nearly as possible, the same amount of time to the other side to reply. In court, if a man argues a case, it is generally understood that the other side shall have an equal opportunity to reply; and if a man examines a witness, that the other side shall have an equal opportunity for cross-examination, that whatever is offered as evidence on one side may be explained or

rebutted by evidence on the other. That is my feeling always, in every hearing. We are here to-night, as we have been for the last one or two sessions, with this inevitable fact before us, that the time of our service as this Committee is fast drawing to a close. At the end of the year, the Committee will consider their duties, as a Committee, ended. Of course, if we are to make up our minds on this subject, and present a report to the City Government, it must be done this year. After the first of January, the Committee ceasing to exist, we can present no report embodying the result of our labors to anybody.

Upon the matter of printing, I understand that the phonographer is taking down for both parties an impartial statement of what occurs here, and the manuscript is at the disposal of both the city and the Gas Company. I have never understood that the city proposed to publish, in exact detail, word for word, all that occurs in the Committee. I certainly was not desirous of having it published at all, but simply that any member of the Committee, having been absent, might take the report, in manuscript, and read it; but a majority of the Committee thought it best to have it published, and not having any special objection to it, I assented. It was simply, as I understood, for the use of the Committee. Now, I don't suppose that the city propose to publish, word for word, all that has been said here. If they publish any thing, I suppose it will be the Report of the Committee, when made. What that Report is to be I have no knowledge. I have never consulted with the Committee, or with any individual member in regard to what report we shall make. I do not suppose that we shall print with the report the whole evidence, but only what we believe to be the result of the evidence, — the evidence being preserved in the record, and always accessible to those who wish to verify the conclusions of the Committee. I am willing to give the Gas Company every opportunity possible, and I do not think it would be right to say that after to-night we cannot give them any further hearing. We are all pressed for time. The Council are so pressed, that they have called an extra session for next week, and probably will be obliged to call another for the week after, and perhaps still another for the week after that. We are in this dilemma; but still I think that, as we have taken up rather more time than the Company have, we ought to give them as much time as possible, under the circumstances.

If there was plenty of time, I should not be in favor of fixing

any limit, except that which a reasonable consideration of the subject would require. But we are limited for time, and the thing must be brought to a close at an early day. I would like to ask Mr. Jewell how much time they desire, and what evidence they desire to offer, that we may see if we cannot fix some time to close the hearings.

Mr. JEWELL. I will answer that question. We have several witnesses who will occupy an hour and a half or two hours to-night, possibly, without calling Mr. Greenough at all. We should like this evening, and one other evening for testimony, and then an opportunity to be heard in argument.

Mr. HYDE. With the exception of Mr. Greenough, can you probably finish to-night?

Mr. JEWELL. I should think so. Not all we should like to put in, but what, under the circumstances, we will content ourselves with. We did propose to have Mr. Adam of New York, and Mr. Sabbaton of Albany, as well as Mr. Sabbaton of New York, three as eminent men as Col. Roome, on this question; but that we forego.

It occurs to me (to counterbalance what was said about Mr. Blake) that Mr. Gardner Warren was called on one of the evenings when we offered our testimony, and occupied about as much time as Mr. Blake.

With reference to the printing, I supposed the whole was to be printed; and what led me to suppose so was the suggestion made by Mr. Stackpole, that there was no occasion for calling Prof. Rogers, because he had testified once. On reflection, and on examination of his testimony, we have thought it would be necessary to call Prof. Rogers, if his testimony given last spring is not to appear in the printed report.

Mr. HYDE. I suppose that stands in this way: that testimony is in manuscript, as well as the other; the Committee have all heard that, and it is as accessible to the Gas Co. as to the city. The city did not go into that matter again, as it was pretty thoroughly gone over last spring, and it was desirable to save time.

Mr. JEWELL. The objection we have is, that this appears as a city document, and it will not be a complete record of the evidence. We understand that a large number have been printed,—500 copies.

THE CHAIRMAN. Only 300.

Mr. JEWELL. It makes no difference whether it is 300 or 500,

at will not be a full statement of the hearing: and if there had en any suggestion to us, that there was a question of expense, should have been perfectly willing to pay half the printing l, precisely as we pay half the phonographer's bill.

Mr. HYDE. I don't understand that this is a city document, in e sense of going on file, and being placed upon the desk of each ember of the Government. I suppose the Report of the Committee will constitute the city document.

THE CHAIRMAN. Suppose we settle this question at once, for we re wasting time. If the Committee are in favor, if the Company ill pay half the whole expense of printing, of printing that portion of the examination which took place last spring, as an appendix, they can say so.

Mr. JEWELL. We will pay half the expense of printing the whole record, exactly as made by the phonographer.

THE CHAIRMAN. I have no objection to that: and let this that you consider of so much importance go in as an appendix to the whole. If the Committee are in favor of that, they will say so.

The proposition was agreed to.

On motion of Mr. HILL, it was voted that two evenings more be devoted to the hearing. — Monday and Wednesday of next week.

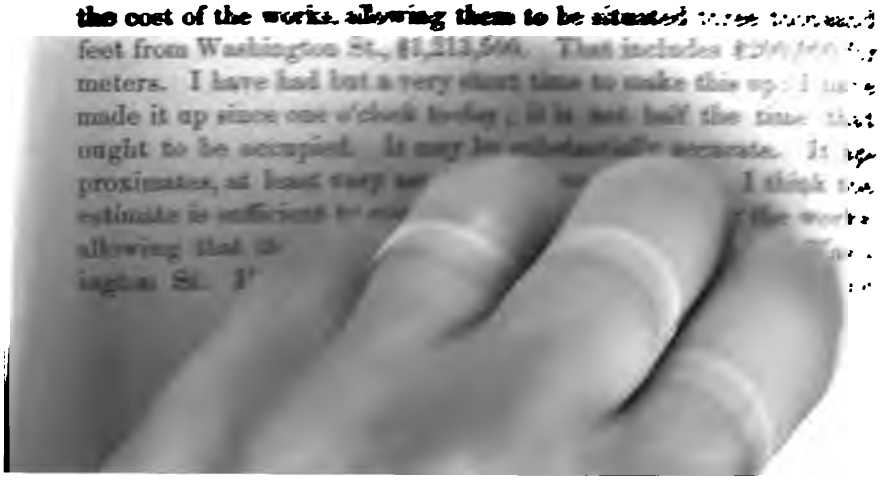
GARDNER WARREN, *Recalled.*

Q. (By Mr. Stackpole.) Have you made any more calculations upon the subject on which you were examined at the previous hearing?

A. I have made some calculations with regard to the cost of gas works.

Q. State what they are.

A. After going through an estimate for the retorting, purifying-house, tanks, gas-holders, and pipe, the result I find I make the cost of the works, allowing them to be situated three thousand feet from Washington St., $1,213,500. That includes $[illegible] meters. I have had but a very short time to make this up: I have made it up since one o'clock to-day; it is not half the time that ought to be occupied. It may be substantially accurate. It is approximates, at least very [illegible] I think [illegible] estimate is sufficient to [illegible] the works allowing that [illegible] ington St. [illegible]



revised and perhaps corrected. Making it up so rapidly, perhaps I may have made some mistakes. It is a very short time to make up an estimate for so much length of streets, — sixty miles. I understand there is that length of streets, and I have made the estimate for sixty miles.

[The cross-examination was reserved until a future time.]

TESTIMONY OF JOSEPH H. CONVERSE.

Q. (By Mr. Jewell). State what is and has been your connection with gas-making, and how long it has continued.

A. I am Treasurer, and have had the general management and oversight of two small companies, one located in Malden and the other in West Cambridge.

Q. How long have you been connected with gas-making?

A. Since 1858.

Q. Are you interested at all in the Cambridge Company?

A. I am, as a stockholder.

Q. You are largely interested in the mining of coals, are you not?

A. I have been engaged in that for the past five or six years.

Q. Take the Malden Gas Company when was that incorporated?

A. In 1854.

Q. About what is the number of consumers of that company?

A. We have at present between 400 and 500.

Q. At what price do you sell gas?

A. We charge $5.00 a thousand.

Q. That is, $5.00 and the United States tax?

A. $5.00 and the United States tax a thousand.

Q. What retorts do you use in manufacturing your gas in that Company?

A. In the Malden Company we use clay.

Q. In the West Cambridge works, what retorts do you use?

A. In the West Cambridge we use iron.

Q. What coals do you use in the manufacture of your gas?

A. We use Cape Breton, altogether.

Q. You and your associates mine coals in Cape Breton?

A. We do.

Q. And that determines the question, probably, what coals you will use, or that is one of the elements?

A. That may have some influence, of course.

Q. What dividends have you been able to pay in the Malden Gas Company?

A. The Malden Co. started in 1854. I think the first dividend was paid in 1859. We paid six per cent that year. The next year, we paid three per cent. The next year, 1861, we paid three per cent; in 1862, we paid three per cent; in 1863, five per cent; in 1864, four per cent; in 1865, two per cent; and in 1866, this present year, we shall not be able to pay any.

Q. In the West Cambridge Company what do you charge?

A. We charge $5.00 and the tax per thousand.

Q. When was that company started?

A. That was started in 1859.

Q. There you use iron retorts?

A. Yes, sir.

Q. What dividends have you made there?

A. We have only made two dividends of two per cent each. We paid in two years two per cent each year.

Q. And some years you have made no dividends?

A. We have made no dividends there since 1861.

Q. What did your coals cost you in 1860?

A. I think in 1860 we used some Pictou and some Cape Breton, and I think it cost $4.30. The cost of transportation to the works was about $1.00 a ton. It cost about $5.50 delivered in the shed at the works.

Q. What was the price of the same class of coals in 1865?

A. It was in 1865 about $10.50. Rather less than it was in 1864.

Q. Including cartage and storage?

A. About $10.50, delivered, in 1865.

Q. What is the cost this year — 1866?

A. It will be very nearly that.

Q. So that the coals you use are about double in price, and have been for the last three years?

A. I should think they would average that. One year, — 1864, — the price went up to about $12.50.

Q. Your works, I suppose, are as perfect as any small works need be?

A. I think so.

Q. Now will you state whether you have observed the comparative value of iron and clay retorts in your two establishments? If so, what is the result?

A. We have a detailed monthly report made up by our superintendent which is made up into a quarterly report once in three months. In looking at my books to-day, I noticed that in West Cambridge, where we use iron retorts, the yield of the coal was $3\frac{55}{100}$ feet to the pound. In Malden, it was $3\frac{57}{100}$ feet.

Q. That is you gain $\frac{2}{355}$?

A. It would appear that in that quarter there was a difference of $\frac{2}{355}$.

Q. Using the same quality of coal?

A. Precisely.

Q. State whether you are familiar with the Boston Gas Works.

A. I have been somewhat familiar with them for the last six or seven years.

Q. When did you last visit them?

A. This week. I was there Tuesday.

Q. Have you visited other large gas works in this country?

A. I have, sir. I have visited pretty much all in New York, — the Manhattan, the Brooklyn, and also the Philadelphia, besides several smaller ones; also the works in Halifax.

Q. Will you state, from your knowledge of gas works, what is the character of the Boston Gas Works?

A. I have always regarded them as exceedingly well-managed works; and, in proof of it, I have been in the habit of consulting them, individually or through my superintendents, for the last six or seven years.

Q. State whether, as a gas-making machine, it is or is not as good or better than any gas work of like size on the Atlantic coast.

A. I should think it would compare favorably with any other works that I am acquainted with.

Q. You heard the testimony of Col. Roome and Dr. Howe on the subject. State whether your opinion coincides with theirs.

A. It does. I was particularly struck with the heats, and with the general management of the works — the general economy; and I must say I don't see how it could be materially improved. Nothing human is perfect, but I think they manage it with as much economy as any company I know of.

Q. What was the quality of the gas, as far as you could judge from the quality of the coals you saw being used?

A. I saw the gas. I did not see it measured. I would not pretend that I could estimate the quality of the gas within four or

five candles; but it struck me as I looked upon the gas, that it would certainly reach 18 candles. Subsequently, I heard Col. Roome testify that he had measured it, and it was 20 candles.

Q. Can you state to the Committee what your gas costs to manufacture?

A. Well, in West Cambridge, it cost us more than $5.00 a thousand feet in 1864, because we didn't pay our expenses. In 1865, it cost us over four. The Malden gas costs us just about $4.00.

Q. State whether, in your judgment, from your knowledge of the price of materials, coals, and the like, any company, however large, could make gas, with the present price of materials, and sell it at less than $3.00 a thousand and make a dividend.

A. I don't see how it can be done.

Q. Do you know about the operation of the present inspection law — whether it is or is not satisfactory to the people in the community where your works are?

A. I have heard no complaint. I supposed it was generally satisfactory.

Cross-examined by Mr. Stackpole.

Q. What offices do you now hold in private gas corporations in this State?

A. I hold the office of Treasurer of those two I have named.

Q. You are Treasurer of the Malden and West Cambridge Companies?

A. Yes, sir.

Q. Do you hold any office in any other company?

A. Not in any other gas company.

Q. Do you own any stock in those companies?

A. I do, in those two companies.

Q. To any large amount?

A. Well, I have, nominally about $5,000 in each company.

Q. Do you supply coal to those companies besides?

A. Our mine that I am interested in has supplied part of it, and part of it is from the Lingan, which we have no interest in.

Q. You supply from your mine what kind of coal?

A. Very much the same as the Lingan. It is bituminous coal. It is not exactly like the Pictou, but very similar.

Q. And those mines, that you are interested in, supply the coal to the company?

A. I say, partly. We have some from the Lingan. We have no interest in that.

Q. How many miles of pipe do you have in Malden?

A. Well, we must have very nearly 25 miles.

Q. And 500 consumers?

A. Between 4 and 500.

Q. And how many miles in West Cambridge?

A. Pretty nearly 20.

Q. And how many consumers there?

A. I think about 300. I won't say certainly.

Q. And how many feet of gas do you manufacture each year in Malden and West Cambridge?

A. We manufactured last year in Malden 4,743,900; in West Cambridge, 2,475,190.

Q. Have you increased your stock in either company since you started?

A. We are increasing it as we enlarge the works. That is the only way we increase it. That is, when we lay down additional pipe.

Q. I asked you if you had increased your stock.

A. We have increased it as we have enlarged the works from time to time.

Q. How is it increased?

A. It is increased in this way. The people come, and say they they would like to have the pipe extended up by their houses. We say, "If you will subscribe for stock enough to pay for laying the main, and will guarantee that you will consume gas enough to pay the expenses, we will furnish it.

Q. Do you issue stock to the old holders?

A. No, sir.

Q. How much did you sell your coke for in 1860?

A. I don't remember.

Q. How much do you sell it for now?

A. The truth is, in our small companies we don't sell a great deal; we consume most of it under our retorts. My impression is, three or four dollars.

Q. Don't you get a good deal more than in 1860?

A. Oh, yes, sir.

Q. Coke rises in proportion to the price of coal?

A. Yes, sir.

Q. I suppose you are aware that clay retorts are used in most

gas companies, to the exclusion of iron retorts? Isn't that so?

A. Well, the Manhattan, the New York, and the Brooklyn, I think, pretty much altogether; the Philadelphia, when I visited them two or three years since, used iron altogether. It is a debatable question which is the cheapest, and I have started this experiment of having one company use iron, and another clay, that I may determine more certainly. There are, of course, other elements.

Q. I only asked in regard to which are used, as a matter of fact.

A. Iron are used more than clay; I think there is no doubt about that.

Q. How about the works abroad, — are you acquainted with those?

A. I didn't speak of the works on the other side.

Q. I ask you now about the works abroad.

A. I can't say comparatively; they are both used.

Q. You spoke of the inspection law in Malden and West Cambridge. Do you have many complaints of the gas there?

A. We have not, sir.

Q. Do you have complaints of the meters?

A. We have those complaints very constantly. The people are very constantly grumbling at their bills.

Q. But you don't have complaints of your gas?

A. We don't have any complaints of the illuminating power of the gas. We have complaints of the meters, when people think their bills are too large.

Q. Then you don't call in the State Inspector to examine the quality of your gas?

A. He has been there and measured our gas. His duty is to go whenever he pleases. He has been there and examined our gas; and, whenever we have complaints of the meters, we say to our customers, "We have bought a sealed meter."

Q. How often do you say the State Inspector is out there to inspect the quality of your gas?

A. I can't say when he was out there last. He goes as often as he pleases.

Q. Is it inspected every day?

A. No, sir.

Q. Every week?

A. No, sir.
Q. Every month?
A. No, sir; they are small works.

Q. (by the Chairman). Does he do it as often as once a year?
A. I can't say certainly he does it once a year. I know he has been there, because our Superintendent has told me so.

Q. (by Mr. Stackpole). You have not seen him there yourself?
A. No, sir; I don't live there.
Q. I suppose you visited the Boston Gas Works at the request of the company for the purpose of testifying here?
A. Yes, sir.

Q. (by Mr. Hyde). When you said that your gas cost you $4.00 a thousand feet, did that include the cost of the gas merely, or include the interest on your stock and your repairs?
A. The interest had nothing to do with it. It is made up from the actual cost of the raw material and the labor required to manufacture the gas.
Q. And not repairs?
A. Well, yes, sir, necessary repairs. You will understand that the repairs are put in; and new retorts, we reckon them as part of the repairs, and their cost appears as part of the cost of making the gas.
Q. Did you include in it the cost of the iron, and laying the pipes?
A. No, sir.

Q. (by the Chairman). If your population was as dense as Boston, you could afford your gas at half what you charge out there?
A. Not with the present price of material, we couldn't afford it at $2.50.
Q. What does your coal cost you now?
A. It will cost us at the works over $10.00.
Q. Is it carried to your works in vessels?
A. It is landed at Charlestown.
Q. What amount of coke do you get from a ton of your coal?
A. I can't answer that question now.

Q. (by Mr. Hills). What is the percentage of leakage in both your companies?

A. It varies some. From 17 to 20 per cent.

Q. (by the Chairman). Are not your pipes badly laid?

A. No, sir; we think they are very well laid, but you know that in small companies, the percentage would naturally be larger than in large companies where there is a very much greater flow of gas.

Q. (by Mr. Hills). Is it not generally the case that there is more waste on account of the pipes being badly laid?

A. I am not aware that it is on that account. The percentage will increase with the pressure; and if you run fifty million feet through, there is only about so much escapes, which reduces the percentage from what it would have been if there had been only half that.

Q. With how great pressure do you force your gas through the pipes?

A. I never have measured that. We have two 20,000 feet holders. We sometimes find it necessary to pile weights upon the holders, but I have never measured them.

Q. You don't know what the pressure is at the burner?

A. I have no doubt our Superintendent has that, but I cannot tell you that now.

Q. (by Mr. Jewell). The pressure at the burner must be what the consumer makes it, by turning his cock on or off?

A. Yes, sir. Col. Roome explained that so fully, that I don't know as I can add any thing to it. It can be regulated first by the main cock in the cellar, and afterwards at the burner.

Q. (by Mr. Stackpole). Is it not more economical for the consumer, if the pressure is regulated before the gas gets to the meter, than if it passes through the meter, and is regulated at the burner itself?

A. I think so.

Testimony of Gardner G. Hubbard.

Q. (by Mr. Jewell). You are connected with gas manufacture, I believe. Won't you state to the Committee in what way, and for how long a time?

A. I have been connected with the Cambridge Gas Light Co. and with the Malden, the West Cambridge and the Newton since they were started, and a director and stockholder in each of them.

Q. You are President of the Cambridge Gas Co., are you not?

A. Yes, sir.

Q. You have taken a pretty deep interest in the management of the affairs of that company, of course.

A. Yes, sir. Not particularly in the philosophical part, of course but I have taken particular interest to see that they made money.

Q. The capital of the Cambridge Gas Company is $275,000?

A. Yes, sir.

Q. And I think the production is about one-eighth that of the Boston Gas Light Company?

A. I believe it is, sir.

Q. Will you state how familiar you are with the gas companies in other cities?

A. I have been into them. I have examined the gas works in New York, — I mean those of the Manhattan, which is considered the leading gas company in this country; one of the show companies, to which every one goes who wishes to learn any thing; and also the companies in Philadelphia, and various other cities.

Q. State whether you have had occasion to make any special investigations as to the cost of gas in this vicinity; and, if so, what led you to make it, and what the result of that investigation was.

A. In the winter of 1864, I found that the Cambridge Gas Co. was rather running behind; that they were making but little more than enough to pay their expenses; and that led me to make a comparison of the cost of making gas in Cambridge, and in various other companies similarly situated; and I found that at Cambridge we were doing just about the same as the other companies; and for the year 1863, our cost was $2.36 per thousand feet; — the cost with us being increased over that of other companies on account of the extra cost of getting coal to our works.

Q. Was that the cost at the station meter, or the cost deducting the leakage?

A. That was the cost deducting the leakage.

Q. In 1863, what was the price of coals and other materials, compared with the prices at the present time?

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of the quality the Boston Gas Company now make, at a less price than $3.00 a thousand.

A. I shouldn't think it could be, sir.

Q. In 1859 or '60, you were one of the parties who proposed to establish the Shawmut Gas Company?

A. You have not stated it exactly correctly. The Shawmut Gas Company was started, and had the right of opening the streets, and I was one of a company who proposed to introduce gas to the city, or, rather, to furnish it to the West End of the city. We notified the city that we proposed to build the works, under the right which we had; at first, the project was received favorably, and they proposed to sell us a tract of land; or, rather, the Committee on Public Lands proposed to sell us a tract of land. Then some question arose whether it would not be a nuisance to have it in that part of the city, remonstrances were sent in, and a long hearing was had, which resulted in the city taking away the right which we had to open the streets.

Q. When you first proposed to go into that operation, what was the price at which the Boston Gas Company were selling gas?

A. They were then selling gas at $2.50 a thousand.

Q. They shortly after reduced to $2.25, did they not?

A. Some little time after, they reduced to $2.25 a thousand.

Q. State whether or not the price of $2.50 a thousand had any connection with your engaging in the enterprise.

A. Well, sir, the margin at $2.25 was so small, I don't think we should have undertaken it if it had been at that when we first started. All we proposed to do was to furnish gas to the citizens at $2.25 and divide 8 per cent upon our stock.

Q. That you thought you could do, if you could have the exclusive occupation of the territory south of Dover Street?

A. Yes, sir.

Q. And build your works upon the South Bay?

A. The proposition was to carry the gas from Pine Island, under the channel, in pipes made of boiler iron, which landed us very near the centre of the district, so that no long pipes and no very large pipes were required.

Q. Pine Island is just on the edge of Roxbury?

A. Yes, sir. It seemed to be a beautiful place for gas works.

Q. You tried to get the right to lay pipes from Pine Island from the Aldermen of Roxbury?

A. Yes, sir, without success.

Q. Was there not great opposition made by the people of the South End to the scheme of having gas works in that neighborhood?

A. Yes, sir; they all preferred to have them at some other place. There was no opposition to having them built on Pine Island, except that the city of Roxbury objected.

Q. Do you know of any place in the vicinity of Boston where works large enough to supply the whole city, could be built where they would be less objectionable, on the score of nuisance to the surrounding neighborhood, than at the old place at the North End?

A. If you go some way further off, they would be less objectionable on that ground, provided you could get water accommodations; but in building gas works, you have so many things to look after that it is difficult to get a good situation for gas works like the Boston works. If you want to get your coals cheap, you must have your works where you can have good wharf accommodations. You ought to have wharves where you can bring vessels drawing at least 18 feet of water; and if you cannot have that draught of water, you cannot make the best terms for your coals.

Q. As a matter of fact, are not the Boston Gas Works singularly well situated in that particular?

A. I should think they were, sir, remarkably well.

Q. Is there any place anywhere about Boston that is equal to that, in your judgment?

A. Why, there might be other wharves in the same general locality where it would answer. You might go to East Boston, perhaps, and find just as good localities there, or to Charlestown, where you are right on deep water. At both of these places, you have 18 or 20 feet of water.

Q. But up any of the estuaries, you would not have it?

A. No, sir, if you went to Pine Island, you would have only 10 or 12 feet of water, and of course you could not get a large class of vessels up to the wharf; and the business will undoubtedly be done, after this, by a larger class of vessels than it has in times past.

Cross-examined by Mr. Stackpole.

Q. You regard Pine Island as a good place for gas works, don't you?

A. I should regard it, for such works as we expected to build, as an excellent place, where we were to supply only that section of the city. But there was always that objection, even then, that there was not sufficient depth of water for vessels.

Q. Is there any other objection so far as gas engineering is concerned, than that?

A. No, sir.

Q. As a matter of fact, are not the majority of vessels bringing coals of the kinds used by the gas company of less tonnage than those drawing twelve feet of water?

A. I can answer that by saying that we built one harbor in Cape Breton, where vessels could go drawing only twelve feet, and we are now building one for vessels that draw eighteen feet, at double the expense of the first.

Q. I am asking, as a matter of fact, whether the majority of vessels bringing coal draw over twelve feet?

A. I should say that there were probably as many drawing over as under. These British vessels are built in a very clumsy manner indeed, and draw a great deal of water for the tonnage they carry.

Q. You think there are about an equal number?

A. Yes, sir.

Q. Is there any difficulty in laying the pipes from gas works situated on Pine Island?

A. No difficulty at all, if you can get leave.

Q. Now, sir, on what grounds were your proposed gas works objected to?

A. The first place we thought of was on one of the city wharves on Albany Street, and I think it was parties owning real estate on Harrison Avenue who objected.

Q. They objected because they considered that their real estate would depreciate, didn't they?

A. I really don't recollect who the parties were or where they lived. That was, of course, the ground of the objection.

Q. The objection was, that the gas works were considered a nuisance to the neighborhood?

A. Yes, sir.

Q. In your judgment, are not the gas works an injury to any neighborhood where they are placed, as to the value of real estate and the comfort of citizens living directly about them?

A. Well, sir, the gas works at Cambridge are within not over a

quarter of a mile from my house. I don't know that I have ever heard a single complaint of these gas works from any one of my neighbors, some of whom are considerably nearer than I am.

Q. What offices do you hold in these various companies?

A. I am President of the Cambridge, and Director in each of the others.

Q. A Stockholder in all of them?

A. Yes, sir. Don't understand me as saying that I should prefer to have a gas company as my next door neighbor; I should not. It makes a great deal of difference whereabouts a gas company are situated. The prevailing wind, of course, is a southerly wind. If you are right in the lee of the wind, it is much less objectionable on that side than it is on the other.

Q. How many miles of pipe have you in Cambridge?

A. Over 30.

Q. And what is your number of consumers there?

A. Dr. Howe, I think, gave it the other day. I shouldn't like to state.

Q. Perhaps you can state the number of thousand feet you make in a year?

A. We make about thirty millions.

Q. And in Newton, how many miles of pipe?

A. About 20 miles there.

Q. And how many feet of gas?

A. We must average about 15,000 feet a day. Just about the same thing with Malden; they run just about on a par.

Q. About 500 consumers, the same as Malden?

A. Very nearly the same. I don't know the number of consumers. All I know is, that the two run about the same in these respects.

Q. How about your leakage?

A. I should think the leakage was rather more in Newton than in Malden. Our leakage in Newton for the quarter ending the first of August was over 30 per cent; the quarter ending the first of November, 22 or 24 per cent; for the last month, I think it was 12 per cent. For companies making a considerable amount of gas, 10 per cent is about a fair allowance for leakage.

Q. That is to say, for a Company like the Boston Company 10 per cent would be fair?

A. Yes, sir. What we mean by "leakage" is condensation and leakage. Sometimes, when the coal don't yield quite so

much gas as it ought to, there is more leakage than at other times.

Q. What sort of retorts do you use in Cambridge, clay or iron?

A. Clay, I believe.

Q. And in Newton?

A. Clay.

Q. What sort of purifiers do you use in Cambridge, wet or dry?

A. We use dry lime.

Q. And how about the other companies, Malden, West Cambridge, and Newton?

A. Dry, I think, is now used in all.

Q. Is that considered the best?

A. It is the cheapest. I think the wet lime would be considered the best for most purposes, but for some purposes, it would not be quite so good as the dry lime.

Q. You find it more economical?

A. Yes, sir. The best way, undoubtedly, is, if you can afford it, to do as they do in Boston, — use the two.

Q. (by the Chairman). Didn't you testify before the Legislature in 1859 or '61, that you was defeated in your efforts to establish a gas company here in the city by the influence of the Boston Gas Light Company?

A. I don't like to remember so far back as that what I did testify. The Boston Gas Co. did oppose us, they fought hard too; and the right, as I have stated, was taken away. I don't think I used the expression you have just stated, sir. No, sir, excuse me, we did not have any evidence at that time. We made some application to the Legislature, but we were defeated for want of notice. We had no hearing whatever, if you refer to the same year I do.

Q. I refer to the year when an effort was made for an inspection of gas and gas meters in the city here.

A. I was referring to a different year. My impression would be, that I did not give any evidence before that committee at all. I was there, but not as a witness. I think I was there as counsel.

Q. Did you not state before that committee, at the time I refer to, that if the city would give to responsible parties, whom you would present, the right to supply the city of Boston with gas for 25 years, they would give bonds, such as the city would accept,

and agree to furnish gas for $1.50 per thousand feet, and fifty per cent better in quality than the gas was at that time?

A. No, sir, I never said any thing of that kind. There never was a time when gas could be furnished at that rate. The city of Boston cannot make gas a great deal cheaper than we can at Cambridge or than they can at Charlestown. The great difference is, that the great amount consumed makes a small profit go a great deal further than with us. For instance, if they make five mills a thousand feet here in Boston, it is probably equal to 25 mills with us. So they don't gain on the lessened cost of production, but on the amount which they make.

Q. Didn't you state before that committee at the same time that the gas did not cost the company then to exceed 75 cents a thousand feet, and challenge them to show that it cost a mill a foot?

A. No, sir; you have got hold of the wrong person. In the first place, I never appeared as a witness before the committee, and, in the second place, I was working with the Boston Gas Company then.

Q. Were you not about that time making efforts to get a charter for a company here? Although failing in your first efforts, were you not still persistent, and did you not tell me that you meant to push your project and obtain that portion of the city, which you believed would be largely built upon, and be a paying investment?

A. I recollect that conversation. That sounds natural; the other didn't. That sounds very natural. I recognize that; but none of those other suggestions.

Q. (by Mr. Hyde). Did you, in connection with that matter, make any statements of the cost of gas, or what parties would furnish it for?

A. If I did, they were nothing like that, sir, for I never saw any estimate that you could make gas for that sum.

Q. Did you make any statements as to what responsible parties were ready to furnish gas for, if they could have a charter?

A. I think very likely I have repeatedly. The sum we fixed upon was $2.25 a thousand feet, and we had our subscription-books round to obtain parties to sign at that rate.

Q. What time was that?

A. 1860.

Q. (by the Chairman). Don't you recollect saying to me, at

the time I was in conversation with you, that gas did not cost to exceed a mill a foot?

A. "A mill a foot"! I can't have said so, sir. It was not a fact. We never offered to supply gas for less than $2.25 a thousand feet.

Q. I am speaking of your expressions to me in regard to the c st of it, when I was in conversation with you at your office from time to time.

A. No, sir; I never said any thing of that kind.

Q. You recollect we had frequent conversations on the subject?

A. Yes, sir; but we never undertook to furnish gas so that we couldn't make a fair profit out of it; and $2.25 was the very lowest point to which we could figure it down and make a living profit. We of course tried to figure it down just as low as we could, so as to sell below the Boston Gas Company and make a profit; but we found we couldn't do it and live.

Q. You recollect that I was working with you at that time?

A. I know you helped us. You were then, as ever, an advocate of cheap gas.

Q. Who was counsel of the gas company in their opposition to that bill?

A. I think my worthy friend Mr. Jewell.

Q. Who was associated with him? Peleg W. Chandler?

A. I don't think they had anybody before the committee or before the Legislature but Mr. Jewell.

Q. Before the city committee, I mean.

A. I don't think they had anybody with him.

Q. Were not Mr. Jewell and Peleg W. Chandler the counsel?

A. I have no recollection of Mr. Chandler having appeared. I didn't think they needed anybody else.

Q. Was not a report of the arguments of Mr. Jewell and Mr. Chandler published in "The Boston Herald" at that time?

Mr. JEWELL. The Chairman is mistaken about the year. About two years after, there was an application made, in which Mr. Chandler and myself appeared before the city government.

WITNESS. I don't think there was ever a project up for competition that I wasn't there; but I have no recollection of this hearing.

Q. Didn't you state to me at that time that the Boston Gas Light Company was influential in obtaining the signatures of parties at the South End to remonstrances against your having the right to lay pipes up there?

A. I think very likely I did, sir.

Q. Was not one of the declarations of the remonstrants that they deemed it a nuisance to have it there, and that was one of the primary objections with them?

A. The remonstrance will show for itself, sir. I have no special recollection. I should think very likely it may, but I shouldn't like to say without looking at the remonstrance itself. I have no special recollection of any single thing which the remonstrance says; it is merely general recollection.

Q. Do you recollect that I showed you some articles that were published, and that you agreed to all the statements that were made?

A. I recollect to have had the pleasure of reading an article that you wrote for some paper.

Q. In the manuscript?

A. In the manuscript.

Q. Didn't you declare at that time that it would be largely for the interest of the citizens of Boston if there was a competing company, in order that they might have gas at a reasonable price?

A. My views at that time were different from what they are now. What I said at that time was this, — and these were the views on which I went into it. The West End was then increasing very rapidly.

There was a poor supply of gas at the West End of the city. We said that it would cost nearly as much to bring a large pipe from the gas works in Boston to supply the West End and to put up large holders there, as it would to build our works.

Q. What, when they had pipes up as far as Boylston Market long before that?

A. They didn't have any big main. Since then, they have put in a big main, running from their works up, I don't know how far. It seemed to us that the same amount of money they would expend in that work we could expend over there, and in that way supply that section of the city. We thought there was a demand for a company which could supply as cheaply as they could.

Q. Do you know of any additional large pipe having been laid at the South End since the time you were a petitioner?

A. I know I have seen a big pipe laid down through the city.

Q. What part of the city?

A. It was laid down on Tremont Street. There is where I saw it.

Q. Whereabouts in Tremont Street?

A. Opposite Tremont Row.

Q. Was not that when the city was laying the water-pipe?

A. No, I think not.

Q. (to Mr. Greenough). Have you laid a large pipe through Tremont Street?

A. Yes, sir.

Q. How large in diameter?

A. We have two large mains, one 18 and one 12 inch.

Q. How many years have they been there?

A. The 18-inch was laid in 1853; the 12-inch in 1863 or '64 — I don't remember the exact year. That 12-inch main goes to the Roxbury line. It is about 2½ miles long.

Q. (to Mr. Hubbard). Are you of the same opinion now, that if there was a competing company, the gas could be furnished to citizens a great deal cheaper than now?

A. I don't think there are the same advantages now, because they have laid this big main, put in their big holders, and are in a better position now than then. Then they were weak in the supply of gas for that end of the city. They did not deny it; Mr. Greenough did not deny it. They did not furnish gas with great pressure at that time. That was our starting point, and that was the way we made friends, at the West End of the city.

Q. If you were to build works to-day, what would the fact that those mains are there have to do with it?

A. It has a great deal to do with whether we get consumers to burn our gas.

Q. If you made better gas, wouldn't you be sure of it?

A. No, sir; there is not one man in fifty who knows whether he is burning good gas or poor gas. There is not one man in a hundred who knows any thing about how much gas he burns.

Q. Was it not charged, at the time you were a petitioner for this gas company, that your motive was to sell out to the Boston Gas Light Company.

A. I presume it was said so. I don't recollect. I never heard any thing of that kind mentioned. I have no doubt it was said, and I should very likely have repeated it, but I have no recollection upon the point.

Q. Didn't you tell me at that time, that if you got the right to occupy that new portion of the city at the South End, you wouldn't want any more profitable business than you could make out of it, and sell it at less than the Boston Company's?

A. No, sir, not less; because we didn't propose to sell it any less than they did. I have no doubt I said I thought we should make a good thing of it at $2.25.

Q. Didn't you tell me you could sell it at $1.50?

A. No, sir, I never figured it at that rate yet.

Q. (by Mr. Jewell). Was not one of the elements which led you to think you could make a profit at $2.25 the peculiar character of the district you proposed to supply?

A. Yes, sir.

Q. South and west of Dover Street.

A. Yes, sir.

Q. And was it not the fact, that that district was composed almost entirely of private families of considerable wealth, making long evening's burning, and large consumption, and was a very compact district?

A. Yes, sir.

Q. And the consumption was much better distributed through the evening than in other sections of the city?

A. Yes, sir.

Q. The consumption down here is all in one or two hours, and then it all drops off?

A. Yes, sir, so that it requires a large force to supply it during that short time.

Q. Whereas, in a district of dwelling-houses, the consumption begins early and continues late, and is pretty uniform for several hours?

A. Yes, sir.

Q. Is not that portion of the city much more profitable to supply than this section of the city, in that particular?

A. In that particular it is, sir.

Q. (by the Chairman). Do you know of any city in the world that can be lighted so cheaply as the city of Boston, on account of its compactness?

A. Yes, sir.

Q. What one?

A. New York — a great deal more cheaply, sir. In New York, they have got their gas works part on the East River and part on the North River.

Q. Do you believe that any portion of New York is as dense in its population as the city of Boston?

A. Yes, sir.

Q. What part of it?

A. I should say enough to make two or three Bostons.

Q. I know New York is larger than Boston, but what part of it is more densely populated?

A. I should say that all of New York below Fourth Street certainly was more densely populated than Boston — much more. I should say, sir, you would probably find, where you had dwelling-houses, many more inhabitants to the square foot there than you would find in Boston, and where you had stores, you would find a larger consumption of gas in those stores than in Boston.

TESTIMONY OF WILLIAM A. PRESCOTT.

Q. (by Mr. Curtis). What is your business?

A. Dealer in real estate.

Q. How long have you been engaged in that business in Boston.

A. About ten years.

Q. To a considerable extent?

A. Yes, sir.

Q. Are you acquainted with the value of estates at the North End, round about the Gas Light Company?

A. I am at some parts of the North End; Prince Street, Snow-hill Street, and Charlestown Street.

Q. Have you bought and sold more or less estates down there?

A. I have in those streets.

Q. State whether, as the result of your experience down there, you consider that the value of real estate has depreciated there within ten years, or whether it is injured by the proximity of the Boston Gas Works.

A. I think real estate in that vicinity will sell as high at the present time as at any time since I have been acquainted with the North End — say five or six years.

Q. Will you state upon what you found your opinion?

A. I bought an estate on Charlestown St. last year for $8,500, about 200 feet from the gas works, and sold it a few months afterwards for $15,500. I bought an estate on Prince Street, nearly opposite the gas works — within a very short distance — in 1863, for $6,500, which was sold a few months ago for $8,000. I think property on Prince Street would sell as high, or higher, at the present time than at any time within five or six or eight years.

Q. Do you know where Hewes, the baker, lives?

A. I do.

Q. Something has been said here about an estate sold there recently for $1.25 a foot. Were you the purchaser of that?

A. I was.

Q. Will you state how near that is to Hewes?

A. I think about fifty or sixty feet.

Q. What were the circumstances under which that estate was bought at that price?

A. There were sixteen signatures to my deed. It was owned by a great number of parties; they wanted to sell the property and divide it; and they wanted to sell it for cash. That was a very low price, I considered, at the time.

Q. In consequence of trouble about the title, or difficulty of disposing of it, with so many grantors?

A. That was one reason why they wanted to sell it. It was difficult to manage, belonging to so many parties.

Q. What do you consider that estate really worth to-day?

A. $2.00 a foot.

Q. What effect on the value of the property in Prince Street do you think this substitution of a handsome brick wall on one side, in place of the tenements that were there before, will have?

A. I think the property opposite is worth more with the wall you have recently built than it was before.

Q. Have you heard any opinion expressed, by parties competent to express an opinion, that the gas works were deleterious to the health of the people round about?

A. I never have heard an expression of that kind.

Cross-examined by Mr. Stackpole.

Q. Do you live near the gas works yourself, sir?

A. I do not, sir.

Q. What do you say your occupation is?

A. Dealer in real estate.

Q. And you buy real estate, I suppose, as low as you can, and sell it for as much?

A. Yes.

Q. You bought this real estate for $1.25 a foot which you regard as really worth $2.00?

A. Yes, sir.

Q. That is, you got it at 75 cents a foot less than what you regard as its real value?

A. Yes, sir.

Q. How about the estate on Charlestown St., which you bought for $8,500 and sold for $15,500? What was it worth when you bought it for $8,500?

A. I considered it worth at that time some 12 or $14,000.

Q. Now, how about the estate that you bought for $6,500 and sold for $8,000? What did you consider it worth when you bought it for $6,500?

A. I considered it worth $8,000.

Q. (by the Chairman). You say you have had no knowledge of the value of real estate at the North End for more than ten years?

A. Six or seven years. Since I commenced buying real estate at the North End.

Q. Would you be willing to take your family in the vicinity of the gas works, and there live?

A. No, I don't think I would. I don't like the North part of the city well enough.

Q. Would you have any objection to it if there were no gas works in that neighborhood?

A. I should object to living in that part of the city if there were no gas works.

Q. Because you have been located somewhere else, I suppose?

A. It may be so.

Q. Do you think the substitution of a handsome brick wall for dwellings would be any protection to the citizens from the smut and dust around the gas works?

A. No, I don't know that the wall would be.

Q. Don't you believe that the gas works have been the cause of the depreciation of the real estate in that neighborhood?

A. No, sir, I don't. I think it is the great influx of foreign

population; just as Fort Hill has run down, and the North End also.

Q. Did you ever know a place where the foreign population came in that it was not in consequence of the deterioration of the property?

A. No, I don't know that I do.

Q. Was not that the case on Fort Hill?

A. I presume so.

Q. You have had no knowledge of what effect the gas works have had upon real estate in the neighborhood where they are located?

A. No, sir, I don't know that I have.

Q. (by Mr. Hills). Should you object to gas works being located in the neighborhood where you live?

A. Yes, sir, I should.

Q. (by Mr. Curtis). Should you object to them any more than you would to a large iron or brass foundry?

A. No, I don't think I should.

Q. Do you know what effect is produced over your way by the smoke from Hooper's foundry.

A. No, I don't know that I do. I have heard fault found by those who live in my neighborhood — say on Leverett Street. I have heard them say that they got dust and dirt from Hooper's foundry.

Q. What do you consider Hewes's estate worth to-day?

A. $2.00 a foot.

Q. (by Mr. Stackpole). Would you give Mr. Hewes $2.00 a foot for his estate?

A. I would give him $1.75, on speculation. I can sell it for $2.00 without difficulty.

Q. (by the Chairman). In your opinion, if the gas works had never been located where they are, would not the real estate down there be worth a good deal more than it is to-day, considering the time they have been located there and the depreciating influence they have had upon real estate.

A. I really cannot answer that question; I don't know.

Q. Don't you believe a much better class of houses would have

been built in that neighborhood if the gas works had never existed there.

A. No; I doubt very much whether there would in that part of the city; still I don't know. Take Salem Street. Salem Street was one of the best streets a few years ago. The gas works don't seem to have affected Salem Street; still it has all run down. It is full of Jew pawn-brokers and small grocery and other stores; and Prince Street is the same. Some kinds of business seem to work round to the North End, and foreigners have driven away the Americans, and have got possession.

Q. Is it not in consequence of the damaging effect of the gas works, calling in that population?

A. I don't know.

Q. (by Mr. Curtis). Which do you consider the most injurious to property, the gas works down there, or the Irish population?

A. The Irish population.

Mr. Curtis put in the following letter from Mr. James B. Blake: —

WORCESTER, Dec. 9, 1866.

W. W. GREENOUGH, Esq.

My Dear Sir, — Your note of the 8th came duly to hand. I am very much surprised to hear that any person should have made the statement that I ever testified to the cost of the gas at 75 cents per thousand. I never made such a statement; and this past month our gas is costing us $1.74 per thousand for the *single item* of coal alone.

It would gratify me to be able to appear before the Committee to refute any such statements, but my official engagements render it impossible to be present until the last of next week.

Respectfully yours,

JAMES B. BLAKE.

Mr. CURTIS. In 1853, when these gas works were in less perfect condition than they are now, there was a petition for leave to extend up Prince Street, and there was a remonstrance. Touching the question of depreciation of property, of which there was evidence, I prepared, with great care, a schedule from the assessors' books, and I would like to read it to the Committee. It covers a period from the year 1835 up to the year 1851

inclusive. I have not been able to continue it down to this time, because I could not trace the same individual houses or estates. Some of them have changed hands, and some have been destroyed, and I lost my manuscript notes. The schedule comprises 220 estates in the immediate vicinity of the Gas Works, and situated on Snowhill Street, Avenue and Court, Prince Street, Cleveland Place, Sheafe Street, Margaret Street, Hull Street, Hull Court, Salem Street, Snelling Place, Marshall Place, Charter Street, Washburn Place, Phipp's Place, and North Hudson Street.

The sum total of the 220 estates for the year 1835 was . .												$322,500
"	"	"	"	"	"	"	"	"	"	1840	"	439,600
"	"	"	"	"	"	"	"	"	"	1845	"	478,100
"	"	"	"	"	"	"	"	"	"	1851	"	563,200

Mr. Curtis also offered the certificate of the consulting city physicians, in 1832 (Drs. Warren, Shurtleff, Hayward, Randall and Shattuck), in reference to the sanitary influence of the gas works.

THE CHAIRMAN. The same kind of certificates might have been given in Paris at that time, and yet the ablest scientific and medical men there have been advising Napoleon to remove the gas works from the city of Paris.

Mr. STACKPOLE. I do not regard that as proper evidence to go before the Committee.

Mr. CURTIS. We have a reiteration of the same thing in 1853, from Dr. Warren, Dr. Hayward, and one other physician.

Mr. STACKPOLE. It is not liable to cross-examination, and it is liable to a great variety of objections. A good many of these physicians are in the city, and could be called here to testify. It strikes me that would be proper evidence; but to bring up here something said 35 years ago, for which we do not know the motive, nor any thing about it, seems to me very objectionable.

Mr. CURTIS. All of these men are dead, and we cannot have their testimony except in this form. We consider it very competent evidence indeed, as coming at that time, before it was possible to reduce the manufacture of gas to so perfect a state as it is now, and when there were such exhalations from the gas works. Still, such men as Dr. Warren, Dr. Hayward and Dr. Shattuck say that, in their opinion, these gas works are not injurious to the health of the city.

THE CHAIRMAN. My idea is this; if those gentlemen were here to testify and be cross-examined, it would be another thing; but I don't think these old manuscripts, that are so many years behind the time, are relevant to this question at all. If these men were alive to-day, and came here to testify, they might have changed their opinion entirely.

Mr. CURTIS. We have not heard any evidence from scientific men or physicians to control this testimony; not one has been brought in here; consequently, if this was true then, it is to be presumed that it is true now.

Mr. HYDE. I should think that, as there are to-day in the city of Boston, I suppose, physicians of equal competency with these gentlemen, who can be obtained at any moment, their testimony should be presented, if the evidence of physicians is to be offered, instead of offering evidence given at that early day, when the quantity of gas manufactured was very limited, and under circumstances of which we know nothing.

Mr. CURTIS. We produce that evidence. We wanted to save as much time as possible, and it appeared to me that the shortest way was to show what the city physicians said in 1832, and what they reiterated in 1852.

Mr. HYDE. If you desire to have the opinion of physicians, suppose we agree upon half a dozen, call them in, and see what they will say.

Mr. CURTIS. Take the Board of Consulting Physicians.

Mr. HYDE. That we will agree to. [*See Appendix.*]

Adjourned to Monday evening, at 7 o'clock.

MONDAY, Dec. 17, 1866.

The Committee met at the usual hour, and Mr. Stackpole recalled Mr. Gardner Warren.

TESTIMONY OF GARDNER WARREN, *Recalled.*

Q. I wish you would read that estimate [of the cost of gas works for the city of Boston] to the committee.

A. [Schedule read]. I have not included in this any estimate for engineering, superintending the building of the works, or for any extraordinary expenses. I assume that these works are to be built on solid ground, and have made no estimate for piling. I have estimated the foundations.

Q. Have you estimated the land?

A. Nothing for the land. This is simply the works complete for manufacturing the gas, without the land, and without allowing any thing for engineering. I have not included in this a station meter. I meant to have gone to-day and ascertained the price of a station meter. I have included the building for one.

Q. Can you give any idea what a station meter would cost?

A. I cannot give any idea. Mr. Greenough knows better than I do.

Mr. GREENOUGH. I suppose you would need two, in case of accident, and they would cost not less than $5,000 each.

WITNESS. In planning works for the city of Boston, my idea would be to build two rows of benches and two sets of purifiers complete, two centre seals, that shut off the purifiers at pleasure, and two meters. That would make two sets of works complete, one to be used in summer, if you please, and both in the winter.

Q. That would be capable of supplying the city?

A. They would supply two millions. The gas-holders would hold 1,600,000 feet. Then the balance of the two millions would be made during the time of burning — say during the night. If I were to make a plan, I should put in the plan, another gas-holder to be built sometime; but the purifiers are sufficiently large for three millions. That is estimated correctly by getting at the number of bushels of lime which each of the purifiers will require to charge it. I cannot say but there may be some errors. There is a great deal of labor in going through that estimate. There is an immense deal of iron and wood. I might mention one item here; that is the item of iron in the roof. An ordinary iron roof would make $8,000 more. But my idea was to put it on in a shape, that would do away with the necessity of making it in the usual manner that iron roofs are made; thereby making a saving of $8,000. The plan I have in my mind I have no doubt will succeed.

Cross-examined by Mr. Jewell.

Q. Take the item of meters. The Boston Gas Light Co. have sixteen thousand meters in use to-day. Is not a fair price for meters $15?

A Well, I can't say really how many two lights, how many three lights, or how many five lights they have.

Q. The average?

A. An average price may be, perhaps $15.

Q. That would be, then, for the actual meters in use by the city $240,000?

A. Yes. I made some inquiry to-day at Roxbury. They thought the meters would not come up to ten lights. I did not alter that at all. It may exceed it; it may fall short.

Q. If they have sixteen thousand meters, they would have in the neighborhood of sixteen thousand service-pipes?

A. I am not sure they would have street service-pipes to that amount. I didn't calculate that they would.

Q. (by Mr. Stackpole). Do I understand you to say that the meters would cost $240,000.

A. I don't think they would. I made up that estimate assuming that it is correct. I can't say how many small meters they have, but I understand a great many. There are a great many who don't burn more than one or two lights, and a great many offices where they require very small meters, and I have put it down at $200,000, calculating it to be 20,000 five-light, and 13,000 ten-light meters. I thought that was probably correct; still it may be too little; I can't say.

Q. (by Mr. Jewell). A fair price for service-pipes would be eight dollars?

A. I inquired of Mr. Turner, and he thought six dollars was a fair price for those laid in the street. They cost from ten to fourteen cents before putting down, and they are twenty feet, perhaps, in the average. I can't tell any thing about it without measuring; I have not measured them. Twenty feet is what is usually allowed by the Company.

Q. In building new works, wouldn't you lay out your works, buy your land, and make your plans sufficient in size, for the production of gas, two, three, or five years ahead?

A. Yes, I should have the works large enough to produce all that would be required in that time.

Q. If the largest consumption to-day is two millions, would you dare to build works that were not calculated for a yield of two and a half or three millions?

A. These are calculated for that, very nearly. There are one hundred and forty benches and if you figure upon it you will see. Two tons of coal, twenty thousand feet to a bench, if they were

all working, would be the maximum quantity which would be produced. But it is not intended to work all. Suppose that one hundred and thirty benches were worked, the smallest quantity they would produce would be about sixteen thousand feet to a bench, with Pictou coal. That is a safe calculation. There is a difference of four thousand feet to a bench in the quality of coal that might be used.

Q. I notice your estimate for five telescopic gas-holders, with the columns, is one hundred seventy-two thousand five hundred. Have you an idea that you could build five gas-holders like those now used by the Boston Gas Company, for any thing like that sum?

A. I don't know how they are constructed, how heavy they are, or any thing about it. I could build those of that weight, and they are abundantly heavy. They ought not to weigh any thing like that.

Q. Should you be surprised to know that the gas-holder Mr. Starr is building to-day will cost, exclusive of the land, from $130,000 to $150,000?

A. I should, unless they weigh a great deal more than these.

Q. Does your estimate cover the roof?

A. No, the columns take the place of that, and the cover, and there is not a great difference in the expense. They don't cover their gas-holders in New York, or but very few of them, nor in Brooklyn. These are very heavy columns; about one ton of iron to each gas-holder. That is the weight of the columns and the girders and all the machinery necessary.

Q. What would be a fair charge for engineering the building of such works as those?

A. It would depend upon who had the management.

Q. Would it be less than 2½ per cent, on the cost of the works?

A. Well, I shouldn't calculate it that way. I should think that would be pretty high. I should think that a good engineer could be hired for $5,000 a year. It would depend upon the time it would require to build them. I can't tell exactly what length of time would be required. If they were built very quick, of course the expense would be less than if it took a longer time.

Q. Suppose an engineer was to have a percentage would not 2½ per cent be a fair price for the engineering of such works?

A. I should think it would be rather an extreme price.

Q. What would be a fair price Mr. Warren?

A. Well, if I were to estimate, I should say an engineer could be hired for $5,000 a year. If it took two years, it would cost ten thousand dollars.

Q. Have you an idea that a proper engineer to build gas works like these could be hired for five thousand dollars a year, — a man competent to prepare plans, specifications and drawings, and every thing of that sort?

A. I should think so. I believe the engineer of the Brooklyn Works was hired for a little less than that. The works were nearly as large as these, not quite. I first laid out the works.

Q. What is a fair amount to add for extras and extraordinary matters which you have not included in your estimate?

A. Well, if I were to put down any thing at all, I should put down ten per cent for extras. I can't tell what might happen. There might be accidents. I have made no calculations for extraordinary expenses and no calculation for piling as I named before; nothing but hard soil.

Q. If you had piling or bad soil it would add an indefinite sum?

A. It would be impossible, of course, to estimate the amount that would be required. It would be difficult to tell, I am sure, what the piling would cost.

Q. And you have assumed only 3,000 feet of forty-inch pipe?

A. That is all.

Q. I suppose that is based upon the statement you made the other night that you assumed the works are to be within 3,000 feet of Washington Street?

A. Yes, I located them at Pine Island.

Q. You think that is within 3,000 feet of Washington Street?

A. I think it is. It was estimated less than that — 2,500 feet; but I think it is 3,000.

Q. How much land should you think it would be necessary to secure in locating works for the city of Boston, so as to provide for their gradual development as the city increases?

A. I should think they ought to have six acres.

Q. Would six acres be half enough, Mr. Warren?

A. I think it would. I have not thought of that subject at all.

Q. How many acres has Pine Island?

A. I understand it has about two and a half or three acres.

Q. And Pine Island is situated within 3,000 feet of Washington

Street, and of course between Washington Street and it, there are a large number of the best residences at the South End?

A. No, I don't see that there are any at all. That street is not occupied by any valuable dwellings at all.

Q. Have you an idea, Mr. Warren, that to purchase the necessary land and put up works such as the city ought to build in view of its future increase, would cost less than two millions of dollars?

A. In answering that, I should have to say, if the price of land did not exceed one dollar per foot they could do it for that.

Q. If the price of land did not exceed one dollar a foot, it could be done for two millions of dollars?

A. I think it could.

Q. (by the Chairman). If you were to take a contract to build works now, you would introduce many improvements on the works at the North End, for instance, would you not?

A. I have never been through the works, and can't tell you. I never examined them at all. I was once inside of them, fifteen years ago, but never since.

[The reporter requested of Mr. Warren the schedule he had read, to be embodied in the report, but he declined to allow it to be used in that way, stating that he desired to revise it, and to make some remarks in connection with it.]

Mr. JEWELL. I think we have a right to that paper which has been presented and read here to be put into the records. I think it ought to go there. It has been the basis of our examination.

THE CHAIRMAN. We have no objection to your having it. We have employed Mr. Warren to make an estimate of the expense of suitable gas works for this city, for our own enlightenment as a Committee. We think it is perfectly proper that it should go into the report, after he has finished his figures.

Mr. JEWELL. We think we have a right to it, as it has been read here, to go into the report, for it is what we have based our inquiries upon.

THE CHAIRMAN. Mr. Warren was recommended to the Committee very highly by Mr. Healy, city solicitor, and Mr. Farrington, of Roxbury, who has had an ownership in different gas works, as an expert and scientific man, and hence he has been employed to

make this estimate as I have said, for the Committee's enlightenment. It was very necessary for them to have his assistance in their conclusions. I do not see myself how his estimate belongs in any manner to this investigation. It is a thing that belongs simply to the Committee, to assist them in their conclusions.

Mr. CURTIS. I should like to ask what he was brought here for?

THE CHAIRMAN. He said he was willing to come here and be cross-examined by you to-night, and I said, very well, if he was he might come. I don't know why he should come, as he was employed to make the estimate for the Committee.

Mr. CURTIS. Why was he brought here the other evening to present an estimate which he took away and now brings back again?

THE CHAIRMAN. We had not employed him then to make his estimates in such a thorough manner that he would be willing to take a contract upon them.

Mr. CURTIS. The question is, simply whether he was asked to come here as a witness; if he was, his statements should go into the report.

THE CHAIRMAN. He was called here the other evening as a witness. He was subsequently employed to make this estimate for the Committee.

Mr. JEWELL (to Mr. Warren). Do you decline to leave the papers which you have read to the Committee to be copied into the records?

A. I do at present. I have no objection to their having them when I have examined them thoroughly. I would state, that instead of its being three days' labor to make that estimate, it is, as Mr. Greenough says, as many weeks' work as I had worked hours on Saturday.

Q. Do you mean that the Committee shall understand, or that anybody shall understand, that the estimate you have read of $1,233,000 is any thing like a correct estimate of the cost of gas works for the city of Boston?

A. I believe it to be substantially correct.

Q. If it is, what is your objection to allowing the reporter to put what you have read here into his report?

A. There are some remarks to be made that I wish to put in, and I wish to look it over carefully and see that it is substantially

correct. I don't think there is an alteration of any kind to be made.

Q. Will you present it at the next sitting of the Committee, and then allow it to be put on the record?

A. I don't know that I will. It depends upon circumstances.

THE CHAIRMAN. I will say that we intend to have that estimate in our report, and you can have the benefit of it.

Mr. JEWELL. We hope that whatever is to go into the report of the Committee we shall have an opportunity to examine before the report is presented.

THE CHAIRMAN. I can't conceive that the Boston Gas Light Co. has any thing to do with it. This Committee is seeking for information, in regard to building of gas works by the city of Boston, and they applied to Mr. Warren for light upon that subject. I don't know what business the Boston Gas Light Co. has to inquire as to that estimate made for the benefit of the Committee.

Mr. JEWELL (to Mr. Warren). You had an estimate at your last appearance before the Committee, had you not?

A. Yes, sir.

Q. From which you made statements as to the cost of gas works?

A. Yes, sir.

Q. Did you not take that paper away for examination?

A. Yes, sir.

Q. And have you not now redrawn the paper, and brought it here this evening?

A. What I brought here this evening is a correction of the last. Still, as I said in the outset this evening, there may be errors that I overlooked.

Q. You don't think that is sufficiently reliable for you to be willing to put it upon the record?

A. I think it is a reliable estimate, very nearly. I don't think there is $5,000 either way. [*See Appendix.*]

TESTIMONY OF GEORGE D. RICKER.

Q. (by Mr. Curtis). Where do you reside?

A. At the corner of Salem and Hull Streets.

Q. What is your occupation?

A. I am an apothecary.

Q. How long have you resided there?

A. Nearly twenty years.

Q. Do you reside over your store?

A. Yes, sir.

Q. Do you own your house?

A. No, sir; I don't.

Q. Have you a wife and family?

A. Yes, sir.

Q. Keep house?

A. Yes, sir.

Q. State if you have ever been disagreeably affected or annoyed by the proximity of the Boston Gas Light Works.

A. Not in the least. Never have had any trouble whatever.

Q. How is it about the washing of the family clothes?

A. I never experienced any trouble. I was talking to my wife about that matter this week, and she says she has never experienced any ill effects from them whatever; wouldn't know they were there.

Q. I suppose, doctor, you are aware of the fact that there has been a movement from that part of the town of the best class of citizens?

A. I am not.

Q. They have moved away.

A. Oh, yes, they have moved; but I don't consider the best class have moved away. Good citizens have moved away and good citizens remain. I don't see, myself, but that the neighborhood is just as respectable, and just as good in my immediate vicinity, as it ever was. Some very fine citizens have moved away, but we have had some other equally fine citizens move in and take their places, as far as I can see. Death has removed some of our best citizens, I believe, from old age.

Q. So far as regards the effects of the gas works upon the health of the citizens who live near them, what has been your opinion?

A. My opinion has been that they are not injurious to health; if any thing, I think rather conducive to health. That is to say, you will probably find less cases of typhoid fever, and those diseases which depend upon an unhealthy condition of the atmosphere, round in the vicinity of that hill than in any part of the city. I know of no place where there are so few of those diseases.

My business brings me into cognizance of these facts; I cannot but notice it. I don't know that the gas house is answerable for it; it may be the location; but such is the fact of the case. We very rarely have a case of the typhoid fever upon that hill.

Cross-examined by Mr. Stackpole.

Q. You don't think there has been any deteriorating effect upon the North End by a different class of people coming there?

A. Yes, sir; the class of people has changed somewhat, but I don't see but what the neighborhood is just as respectable as it ever was.

Q. What direction do you live from the gas works?

A. I live, I should think, about south-east.

Q. And how far distant?

A. I think from three to five hundred feet. I should say five hundred feet was a pretty liberal allowance. It is almost all open between the gas works and my house. It isn't shut in by buildings much. There is Copp's Hill burying-ground, comes almost down to the corner, which leaves it almost entirely open that way.

Q. (by Mr. Curtis). Don't the prevailing winds in Boston carry whatever smoke the gas works make off towards Charlestown or off towards the water?

A. Well, I should think they would, for the most of the winds we get there, at least the first part of the year, are north-easterly ones; but with their present system of burning their smoke the way they do with that tall chimney, we get no trouble from smoke that I see.

(By the Chairman). How long have you been in practice at the North End?

A. I am not a practising physician; I am an apothecary. Very nearly twenty years.

Q. What do you understand to be the producing causes of typhoid fever?

A. I look upon it as the unhealthy condition of the atmosphere more than any thing else.

Q. Is it not produced in the fall of the year, when the decom-

position of vegetable substances is going on to a greater extent than at any other time?

A. It probably might be, if there is a large quantity of it, or any thing of that description.

Q. Have you any idea that the smut from bituminous coal, or the dust from coke when water is thrown upon it when it is all on fire is the cause of typhoid fever?

A. It might be. If you were in a position to inhale much of it, it possibly might. I am not at all posted in regard to it.

Q. Is it any way possible?

A. It might. I can't say, sir. I merely state the facts, without going into theories or any thing of the kind; what I know to be facts.

TESTIMONY OF GEORGE COBLEIGH.

Q. (by Mr. Curtis). Where do you reside?

A. In Hull Street.

Q. How near the gas works?

A. About four hundred feet I should think from the gas works.

Q. How long have you lived there?

A. Eight years?

Q. You keep house?

A. Yes, sir.

Q. What is your business there?

A. Grocer.

Q. Do you live over your store?

A. I live near the store, not over it. I live up Hull Street.

Q. Have you ever experienced any inconvenience from the gas works?

A. I never have.

Q. How is it about your family in that respect?

A. Well, I heard my folks complain more of dirt and dust when I lived on Washington Street than I ever have at the North End.

Q. What part of Washington Street did you live on?

A. Corner of Arnold and Washington Streets.

Q. How high up is that?

A. That is up next to Roxbury line.

Q. Do you hear any complaint at the house about the washing being soiled?

A. No more than any other part of the city from dirt.

Q. Do you hear any thing about crocks or smuts from the gas works on the washing?

A. No, sir.

Q. You don't smell it?

A. I never have smell it since I have lived there. I don't think I have ever smelled the gas at the house, sir.

Q. Do you keep your windows open in summer?

A. As much as people usually do.

Q. In your experience, do you think the gas works have been productive of any depreciation of the value of property there or any other cause?

A. Well, I think that perhaps the element that has moved in to different locations around there may have depreciated the price of property, but not immediately around in the neighborhood where I live. I don't think the gas works have depreciated the price of property around there.

Q. Then do you consider the gas works harmless and inoffensive neighbors?

A. I never experienced any trouble from them at all in the eight years I have lived there.

Q. Have you ever heard that they have been detrimental to people's health in the neighborhood?

A. I never have heard that claimed.

Q. I suppose you have a great many people living around there coming into your store?

A. Yes, sir.

Q. Is there any very general complaint against the gas works?

A. I never have heard any if there has been.

Q. You have had your store open all the time for eight years past?

A. Yes, sir.

Cross-examination by Mr. Stackpole.

Q. What direction do you live from the gas works?

A. Well, it is nearly east.

Q. How did you happen to come here to-night?

A. By invitation.

Q. How did you happen to be summoned by the Gas Company?

A. I was expressing my opinion in my store of the gas works, and some one that was in invited me to come up here.

Q. Who was it?
A. It was Mr. Giles.
Q. Is Mr. Giles connected with the Boston Gas Works?
A. Yes, sir.
Q. He was in the Legislature, wasn't he?
A. I don't know, sir.

Q. (By Mr. Hills). Do you own the house you live in?
A. I do not.
Q. Do you own your store?
A. I do not.

Mr. CURTIS. I should like to read the evidence of an old gentleman, now dead, who formerly lived at 139 Prince Street, — George Hilman. His testimony was taken in 1852.

Mr. STACKPOLE. Well, I object.

Mr. CURTIS. My idea is to show what the gas works were in 1852, and then show that they have been rendered less objectionable than they were at that time. If this old gentleman, Mr. Hilman, who was one of the aristocracy of the North End, was living now, I should call him.

Mr. STACKPOLE. If Mr. Curtis is allowed to put in the evidence of one witness in that way, I may put in a hundred witnesses. It seems to me that it is opening evidence that is hardly competent here.

THE CHAIRMAN. I don't think the evidence ought or can be admitted here. We want living men here. The dead are out of the way of the influence of these works.

Mr. JEWELL. In looking over the report of the hearing that took place many years ago, where eminent counsel were engaged, — Mr. Brigham and Mr. Hale, Mr. William Dehon, and Mr. Booth (who was formerly with Mr. Chandler) and Mr. Bartlett and Mr. Clarke, — I find that in repeated instances testimony of this description was placed before the Committee; testimony of witnesses who had been examined in hearings before the City Government and other cases. This hearing was in 1852.

THE CHAIRMAN. If that testimony is in print, it is within reach of the Committee. I don't think any thing of that kind is relevant to the examination we are engaged in.

Mr. STACKPOLE. I think, if the Committee please, this is a matter of discretion on the part of the Committee. Of course

they can let in any sort of testimony they please; but it seems to me this is going beyond all proper bounds.

Mr. JEWELL. This was a hearing upon the identical question now before this Committee. It was whether these gas works should be removed. A phonographic report was taken in that case, exactly as in this, and printed by the Boston Gas Light Company. We think the whole report is competent to be put in here, but we don't want to take the time.

Mr. STACKPOLE. I move that if any part of it go in, the whole go in. I don't think any of it should.

THE CHAIRMAN. We are now investigating the opinions of the people at the North End with reference to this matter in 1860, and what happened in 1852 I don't think should come in here before this Committee. For instance, when Napoleon took up the question whether the gas works should be removed from Paris, testimony might have been produced, given ten or fifteen years ago, that it was not necessary to remove the works from the city; but the progress of science has changed the minds of people, and hence the works were removed. Now I think the proper testimony for us is of those now living in the city of Boston, not of those who have lived here, have died and been buried.

Mr. STEVENS. I understood Mr. Stackpole to say that he desired to have all go in if any part of it went in.

Mr. STACKPOLE. Yes, sir. I thought if any went in the whole should go in; but I think none should go in.

Mr. STEVENS. That was my idea. If this is evidence, it should all go upon the record as put in.

Mr. CURTIS. I don't want to occupy any more time than is necessary, or lengthen out this hearing; but I do desire to put in three answers from Dr. Hayes's testimony taken at that time.

Mr. STACKPOLE. I object to three answers being read unless the whole of it is read.

Mr. CURTIS. I will read the whole of it. I desire to have Dr. Hayes's testimony put in as regards the nuisance of the gas works at the North End.

Mr. STACKPOLE. Dr. Hayes has been here and his attention was not called to this testimony.

Mr. CURTIS. We will call his attention to it, he shall have a printed copy of it.

Mr. STACKPOLE. I object to it. The desire of the gentleman is to control the testimony of Dr. Hayes given here by his opin-

ions expressed ten or fifteen years ago. Now, it is not only a rule of law, but a rule of sense, that if a man's testimony is to be controlled by any thing he has said previously, his attention must be called to those statements which are relied upon to control him.

Mr. CURTIS. I deny the gentleman's law. That is not the law in our Courts now.

Mr. STACKPOLE. I say it is. I say it is neither law nor is it fair to put in some printed matter that the gentleman has got to control Dr. Hayes's testimony without asking him any thing about it.

Mr. CURTIS. Dr. Hayes can come here and say whatever he wants to say about it.

Mr. STACKPOLE. He has been here three nights I think, and an opportunity afforded to the gentleman to speak about it, and he did not do so.

THE CHAIRMAN. I might come up here with printed testimony in relation to one of the gas companies of New York who have spent $60,000 to have the City Government rescind a contract that they had made with them, in order that they might make a million dollars out of it; but I certainly would not bring it here and put it in as evidence of that fact. Dr. Hayes has been here and testified, and what he testified in the case that transpired years ago, I don't think is applicable to this investigation. I should not think of going around into the libraries and hunting up all that men have said in years past, and then put it into our report and say Mr. So-and-So said so and so, in 1850, or any other year. I don't think it would be right.

Mr. CURTIS. I think it is a very extraordinary state of things that we cannot show that Dr. Hayes has stated differently at one time from what he does now concerning an abstract question of science. That is all.

THE CHAIRMAN. You may turn the pamphlet over to the Committee and the Committee can consult it for themselves.

Mr. CURTIS. I did not propose to put in the whole pamphlet, but only what Dr. Hayes said of the arrangements of the Boston Gas Light Company for suppressing the nuisance of their works, and how thoroughly they had done it; how he left his instruments there and found them perfectly clean and beautiful when he came after them the next time. After taking Dr. Hayes's testimony at that time, so highly in favor of the Gas Light Company and showing

how far their works were from being a nuisance in 1852, we will then go on and show that their arrangements have been still further perfected. That seems to me to be perfectly competent. Then he may come here and explain it as much as he pleases.

THE CHAIRMAN. It seems to me that he should be here to hear it read, and to explain it if he wants to.

Mr. CURTIS. The common rule of law now is, that you are not subjected to the necessity of putting your questions to a witness to draw his attention to the subjects upon which you propose to contradict him. Formerly, that was the rule; but it is not so now. Every man who is put upon the stand takes the risk of being contradicted upon any point relevant to the issue. Now, this is strictly pertinent to the case. Dr. Hayes says that he perceives no dust, and that by the arrangements of the company there can be no dust. We want that shown. He may have altered his opinion since. If he has, he may come here and say so.

THE CHAIRMAN. I suppose that after a witness has been upon the stand and testified, if another witness is called, in his absence, and testifies contrary to what he has said, that goes as his testimony.

Mr. CURTIS. Then the original witness can be recalled again to explain.

THE CHAIRMAN. Then there are two witnesses, one on one side, and one on the other. I don't think printed works are of the same character.

Mr. CURTIS. You may show by printed testimony that a witness has contradicted himself.

THE CHAIRMAN. Perhaps Dr. Hayes can explain it before the Committee, and show that he is perfectly right.

Mr. CURTIS. That is what we are perfectly willing he should do. He has testified that there are dust and dirt flying from those works, and we propose to show that he testified directly to the contrary in 1852.*

THE CHAIRMAN. I don't think it is competent to offer testimony here that was given in a hearing that took place years ago.

* The following are the passages in Dr. Hayes's testimony referred to by Mr. Curtis: —

Q. Is the dust flying in the air, principally from coke?

A. I have not been able to distinguish any dust or soot from the Gas works. I have examined the streets, the sidewalks, and also the tomb-stones on Copp's Hill, but I cannot trace any thing which comes from the Gas works. The principal dust I have seen

TESTIMONY OF WILLIAM W. GREENOUGH.

Q. (by Mr. Jewell). What is your connection with the Boston Gas Light Company?

A. I am the Agent and Treasurer of the Boston Gas Light Company. I became Agent in February, 1852, and Treasurer, March, 1853..

Q. Will you state to the Committee what has been your experience as manager of gas works, and the extent of your observation on the subject in the United States and elsewhere?

A. As Agent and Treasurer of the Company I have had the management of their affairs, and their engineering to perform. In order to make myself familiar with gas works, I obtained such information as I could from study, and also from observation of the principal works in this country and in Europe. I went to Europe in 1858, at the instance of the Company, for the purpose of seeing whether any improvements existed there which might with advantage be transferred to our own works. My experience is a daily experience of the working of a large Gas Company.

Q. State what places you visited in Europe.

A. I visited works in London, Paris, Belgium, Holland, and Scotland.

Q. How long were you abroad?

A. Between three and four months, entirely occupied in visiting gas works.

Q. How did you find your works as they then existed compared with others of a like class abroad?

comes from carting coal. The Gas works are not a centre from which smoke and dust proceed.

Q. How are the Gas works, for annoyance to people in their neighborhood, as compared with other manufactories?

A. As compared with foundries, and machine shops, they are far less objectionable, on account of noise, and dense smoke. As compared with planing mills, match factories, and other factories of that kind, they are less objectionable in respect to smoke, cinders, and danger to the neighborhood from fire.

Q. As to the annoyance of dust and smoke?

A. I suppose they are as free on the inside from any trouble of that kind, as any works can be where coal is largely used. I have frequently been in the habit of leaving my instruments for several days, exposed in the works, without having them soiled. I don't know of any large establishment where coal is used, which is so free from smoke and dust, as this. — "Report of Hearings before the Board of Mayor and Aldermen upon the Remonstrances against the South Gasometer and the extension of the Works of the Gas Company at the North End." — 1853; pp. 73, 74.

A. Much more favorably than I had anticipated before leaving this country.

Q. How were their processes as compared with yours?

A. I may make the general remark, that the processes of various gas companies are different, each working, as it is technically called, upon its own lines, in order to arrive at one result; that is the making of the gas, which they are undertaking to make, of a good quality. I found that we were working upon lines which were more similar to the Scotch Companies than to the English, as we were undertaking to make a grade of gas which was more like that of the Scotch companies than the English, with the exception of Liverpool, and not at all like the gases which were furnished in Paris, Holland and Belgium.

Q. Won't you state in what respects they differed?

A. The gas at that time furnished by the Companies in London with the exception of the Chartered and the Western was what is commonly called Newcastle gas, and it was made either from Newcastle or Lancashire coals. The grade of that gas was from twelve to fourteen candles. The Western and Chartered Companies were making what is called Cannel gas; a gas made from the basis of Newcastle with a mixture of Cannel. The French companies were making their gas from Belgian coal which gave a gas about the same average quality as the common gas in London. The Belgian and Dutch companies were either using Newcastle or Belgian coal; so that the gas of the continental companies was about the same as the common London gas.

Q. You spoke of the Liverpool gas; what was the quality of that?

A. The Liverpool gas was a most excellent gas. Every one knows that the management of the Liverpool company has been for many years in charge of Mr. Alfred King, probably the most scientific gas engineer now living. They used Wigan Cannels for the production of their gas, and made a very excellent gas at that time — about twenty candles. The Scotch gas was similar to the Liverpool, but rather better, the Edinburgh gas particularly.

Q. (by the Chairman). What was the illuminating power of the Edinburgh and Liverpool gas?

A. The engineer of the works in Edinburgh told me that they thought their gas was twenty-eight candles, but I saw no photometric experiments. I saw in Mr. King's laboratory various ex-

periments to test the illuminating power of their own gas, and I can speak from my own knowledge of that.

Q. What had been prior to that time, the grade of the Boston gas, as you had made it?

A. I may say, in general answer to the question, that in Boston we have used, ever since I have been in the management of the works, a Cannel coal in mixture with the common Pictou coal, for the purpose of making a better gas than the ordinary grade. I believe we are the only company in this country who have used habitually Cannel coal for a series of years. The only winter in which we did not use the Cannel coal was the winter of 1854, I think, when all our vessels laden with Cannel coal were either lost or put into Irish ports, so that, after having purchased and used all the Cannel coal in this market, we were without Cannel coal. At that time, we undertook to use a combination, under the advice of Dr. Hayes, which resulted very disastrously for our consumers. That is, it was an oily gas which could not be carbonized, and filled our pipes with oils, &c. Great complaints were made, and it affected us for two or three years afterwards. The basis coal at that time was Pictou coal, but we used some oil residuum and coal tar, for the purpose of obtaining something that should be equivalent to Cannel coal, by Dr. Hayes's advice, who was then in the service of the company, and experimenting.

Q. That was the cause of the large number of complaints of the stopping of the gas pipes and burners, and the filling up of the tubes, which occurred from 1854 along for three or four years?

A. Yes, sir; two or three years.

Q. (by Mr. Curtis). You don't mean that you continued to use the oil residuum for two or three years, but that the effects lasted that time?

A. No, only for three or four months, I think we began to use it in October, 1853 or '54; I am not certain which; I should say probably 1854.

Q. (by Mr. Jewell). That was to make an oil gas in combination with a coal gas?

A. That was to make a rich oily gas, with the common retort.

Q. (by the Chairman). At the time you speak of, before you started this experiment, do you say that you had been using Cannel coal and nothing else?

A. No, sir. We used at that time, I should say, from memory, 25 per cent of Wigan Cannels, mixed with Pictou coal.

Q. You had, at your early advent into the company, made experiments with and examinations of various coals?

A. Yes, sir; that was one of the first things I did. I made experiments to see what combinations of coals would make the best gas;—of coals which we could readily obtain, because not all coals were within our reach.

Q. When did you first begin to use Albert coal?

A. The first experiments with Albert coal were made in 1852. That was then a new coal; in fact, we purchased the first Albert coal that ever came here. Every one was afraid of it, and we were afraid of it. It was so rich a coal that it took a long time to acquire the experience how to properly use it. In fact, other companies who undertook to use it gave it up; they couldn't manage it. If used in too great proportion, oil was carried forward into the mains and fixtures, and it was not a coal that was easy to control. After a long series of experiments, we ascertained that Albert coal could be used in combination with Pictou, in certain proportions, depending upon the temperature; and from that time up to the present, when Albert coal was to be obtained, we have used Albert coal not varying substantially from the proportions which we ascertained then to be the best.

Q. And those proportions are about what percentage of Albert with the common coals?

A. It depends upon the temperature. In summer five per cent; in autumn, seven per cent; and in the extreme temperature of winter, ten per cent.

Q. (by the Chairman). Albert coal produces about 35 candle gas?

A. It would depend a little upon the conditions in which it was carbonized. It is so volatile, it is difficult to carbonize Albert by itself.

Q. Taking the specific gravity, it is about 35 candle gas, is it not?

A. I should say it was not far from that.

Q. Measured by specific gravity?

A. Specific gravity does not furnish any key to the value of gas, or its illuminating power, for the simple reason that gas may have a very large amount of carbonic acid in it, and obtain specific gravity in that way.

Q. (by Mr. Jewell). How did you find the purification of gases abroad?

A. Very different in different cities. In London, I should say the purification was not satisfactory. They were using various forms of purification; the oxide of iron purification, as it is called, which is supposed to control the sulphur, but is insufficient with regard to the ammonia and carbonic acid. In France, better; in Liverpool, very good; in Scotland, excellent.

Q. What retorts do you use for the carbonization of your coals, and what experiments have led you to the selection of the retorts you use?

A. We use an iron retort which was invented by Mr. Giles, who is at present, and has been for some time past, the Superintendent of our works. One of the objects which I had in view in going to Europe was to see what results had been obtained by the best European engineers with regard to clay retorts. I had imported previous to that time some of the Belgian and English clay retorts, and had been unable to get any satisfactory results from either of them. I knew that clay retorts were largely in use in foreign countries, and I wished to see with my own eyes how they were used, and what results were obtained. I found that the engineers differed there very much as they did here with regard to their value; but that this point was considered settled by all, that where the coal was of a character to require high heats for its carbonization, clay retorts were preferable; that if you were working at a heat higher than orange red, a clay retort was more durable than an iron one, and was necessarily preferable. I found the Scotch engineers, who were making the best class of gas, were very doubtful indeed about them. Most of the works had part iron and part clay retorts, they not having arrived at any settled conclusion in regard to the matter. In France, where they were using Belgian coals, they were working very much at the same high heats that they did in London. In London, in the works where the common or Newcastle gas is produced, the grade was twelve candles. I found that quantity was the great object of the engineer. Therefore, the retort which would give him the largest product of gas from his coal was the best for him, irrespective of the quality of the gas which he made.

Q. (by the Chairman). What year was this?

A. This was in 1858. After looking very carefully over the

whole matter, I found that the results which we obtained from our retorts were on the whole more satisfactory than from any clay retorts which I saw in Europe; and for these reasons. It is the only retort that I know of in use in any large company's works, which carbonizes the coal thoroughly. By that I mean it is the only retort which is thoroughly heated up to the mouth, so that all the coal that is within the retort is subjected to the same heat. This result is arrived at by means of a double lid, which forms a non-conductor of the atmosphere, so that the coal which lies behind the second lid is subjected to the heat of the retort, which is heated directly up to the front. The consequence of that is that the hydro-carbons which form coal tar in common retorts form gases in this retort. Besides this advantage which our retort possesses over all other retorts in use, the gas which is carbonized, instead of passing directly from the back to the front of the retort, and rising through the pipe which ascends to the hydraulic main with all the gas generated in the retort before it in its way, in this retort, there is a perfect current of gas passing all the time into the flues which lie in the bottom, so that the circulation is kept up continually in the retort, and as fast as the gas is carbonized, it has an opportunity to pass out, without depositing itself in the form of carbon upon the retort. So that these retorts form less carbon, and in consequence of that, preserve their shape and exist longer than any other iron retort. The entrance to the flues is a little past the middle of the retort, so that the gas is all the time descending through the body of the coal into those flues, and passes out into the chamber and up into the hydraulic main.

Then another advantage which the retort possesses, in consequence of this, is the evenness of temperature throughout; so that I think to-day, if the gentlemen will go to our works, they will see the number of retorts which we have in use more evenly heated than the same number of retorts that can be found in English gas works. They are an even cherry red heat. The importance of this will be seen at once to the gas-maker, who wants to know what results he is going to obtain when he charges his retorts with coal; that he is going to get, day after day, certain absolute results working with the same heats; and hence he is satisfied with these retorts. There is no other where the same certainty of work can be obtained. There are other reasons which I might give here; but I think these are sufficient to show the superiority of our retorts.

Q. How do they compare in economy of result with the old iron retorts?

A. It is very difficult to make an exact calculation, because it can only be done by putting the retorts side by side, and conducting the gas into different receptacles, and all the secondary products in the same way, so that you can see what one does here and the other does there. We used to estimate, in a rough way, that it was from half a dollar to a dollar a day, in each retort.

Q. That is a patented retort?

A. Yes, sir.

Q. It was invented by Mr. Giles?

A. Yes, sir.

Q. And while he was in your service?

A. While he was in our service.

Q. As the result of experiments and observations made there?

A. Yes, sir.

Q. Has the Boston Gas Light Co. the right to use it without royalty?

A. It has.

Q. It has been said that the reason the Boston Gas Light Co. used it, was because Mr. Giles was interested in the patent, and obtained a royalty from the company?

A. That statement is entirely untrue. Mr. Giles, in the most honorable manner, after the invention was made, tendered to the company the use of the retort forever, without royalty.

Q. (by the Chairman). And charges every other one that uses it?

A. Certainly, sir. And certainly he should.

Q. Is there no inducement for you to use it because of the profits on the sale to-day to other companies?

A. I don't see why that should affect their use of it. The Boston Gas Light Co. have no interest in it.

Q. (by Mr. Jewell). And they gain nothing from it?

A. No, sir.

Q. And Mr. Giles gains nothing from its use by the Boston Gas Light Company?

A. Certainly not.

Q. This uniformity of result with these retorts is a very valuable consideration, is it not?

A. We think it is; a very valuable one. Say, for instance, you have a certain number of retorts, you can say, "Now, I am sure that each one of these retorts will produce to this corporation so many feet per day." Then you know what you can make per day absolutely. But if you have got one retort that is going to make 4,000 feet, and another 5,000 feet, and so on, you can't tell what your product is to be absolutely; so you are obliged to fire up and keep in use a larger number of retorts, of course at a greater expense than you would otherwise require, to provide for contingencies.

Q. What is your opinion of the cost of gas engendered by the use of clay retorts in this country? and how extensively are they used as compared with iron?

A. They differ very much. As Col. Roome told us the other night, he works the Cape Breton coals and Pictou coals, five hour charges, and with a high heat. He wants to get 4½ feet of gas to the pound, I think he said. Well, in order to do that, he must work high heats. He said he had melted down iron retorts, which I am not surprised at, because any one who has been at his works can see that his heats are very nearly white heats.

Q. Much higher than yours?

A. Very much higher than ours. Perhaps I should say, that the reason why we work cherry red heats is this: that we have found that with the Pictou and Albert in combination, it gives the best results. Pictou coal is what is called among gas-makers an honest coal, which gives off its gas easily in 3½ hours. It will give more gas if worked longer, but not good gas. It yields its gas in 3½ hours, and consequently in combination with Albert, a very volatile coal, which yields its gas easily with cherry red heat; and we got the best results from these two coals. If we were to use coals requiring higher heats, of course the retorts must be heated higher.

Q. Perhaps it is as well to ask here why you prefer the Pictou coal, for example, to the Cape Breton coals.

A. One reason I have already stated, namely, that it yields its gas readily. It has little sulphur, and is very easily purified. Besides that, having little sulphur, it is safe for storage in large quantities. We can safely pile upon our wharves any quantity which we may require. We take our own risk of spontaneous combustion. I think we are the only large company in the United States that have not suffered from fire through spontane-

ous combustion. The Cape Breton coals, I think some of the Pennsylvania coals, and all the Virginia coals, that I have ever seen, are liable to spontaneous combustion; not all precisely to the same extent, but all have more or less combinations of sulphur, which render them, in my judgment, dangerous for permanent storage. The Brooklyn Company suffered a very large loss last year, and the Metropolitan also. The Manhattan and New York works are always on fire in their piles of coal. I never was in New York without seeing a smoky pile of coal either at the Manhattan or the New York works.

Q. I think it has been said here that you use some Lingan coal. That is a Cape Breton coal, is it not?

A. Yes, sir.

Q. Will you state how you use that?

A. We have tried experiments to see whether we could manage one of the Cape Breton coals, this year, and with very satisfactory results, because we consumed it as fast as it arrived; did not allow it to accumulate in large quantities — not over a thousand or fifteen hundred tons at a time.

Q. (by Mr. Curtis). What is the effect of throwing water on coal, in case of spontaneous combustion?

A. The most rapid way, in case of spontaneous combustion, is to dig the fire out, and then put it out with water.

Q. (by Mr. Jewell). As the result of your investigations with regard to coals and purifying methods, state whether or not you introduced any improvements on your return from Europe.

A. When in Scotland, in conversation with one of the most eminent Scotch engineers, at Glasgow (a gentleman whose name I have lost, but I think it was mentioned the other night by Col. Roome), after telling him the sort of coals we used, the grade of gas we produced, and how similar it was to the Glasgow gas, he made the observation that he had some trouble in controlling his carbonic acid, and asked whether I had found the same difficulty; and I told him I had, to some extent; but still, we did not wish to have any.

He then suggested that he had found an excellent effect from putting dry lime beyond the wet lime purifiers. I thought the idea an excellent one, and on my return home, I put up a set of dry lime purifiers behind the wet lime tiers, so that the gas should

first pass through the wet lime, and then through the dry lime, which has given the result of which gentlemen have spoken here.

Q. Now will you state, in brief, what may be called, perhaps, the strong points of your works?

A. As I said before, every Gas Company works on its own line, so as to save the experience which it accumulates in a series of years, by which it is enabled to do things differently from other companies, or perhaps better, or perhaps more to its own satisfaction. Our own experience with regard to our works is, that there is no Gas Company where the coal is so thoroughly carbonized as at the Boston Gas Company; there is none where the condensation or washing is better, and certainly none where the purification is better.

Q. You have two sets of exhausters, I believe? Won't you state their function, and why you have two?

A. It is merely as a precaution. One exhauster is commonly considered sufficient in a work; but we have put in a second, so that, if accident should happen to one, no misfortune should arise in the works in consequence of stoppage.

Q. (by Mr. Curtis). Won't you state what the exhauster is?

A. It is a machine for taking off the pressure of gas from the retort, so that it shall flow onward just as fast as the coal is carbonized. The effect of the pressure of gas upon the retort would be to give the gas a slower movement, and cause it to deposit the carbon, and so fill up the retort.

Q. (by Mr. Jewell). Will you describe your method of purification, — whether it is or not very perfect?

A. I don't know that I can add any thing to what has been said by other gentlemen, who are not directly interested in the results, as we are. Our wet lime purifiers are probably the most powerful and most efficient of any in the country. I don't know that there are any anywhere, of the same size, that are so efficient. In fact, they are entirely sufficient for our purification, with the exception of any surplus of carbonic acid which may go through, which the wet lime does not reach. The dry lime is intended to take up any impurities which may pass the wet lime.

Q. As a matter of fact, are the results which you get from your gas works satisfactory or not as well to the consumers as to the Company?

A. Well, how satisfactory they are to the consumers, perhaps I am not the best judge. I can only say, that complaints have steadily diminished year by year since I have had the management of its affairs, with the exception of the great year of complaint, which was the year of which I have spoken, when we were out of Cannel coal.

Q. As a matter of fact, state whether or not, within a year or two past, complaints as to the quality of the gas have substantially ceased.

A. There are very few — very few indeed. There are some people, of course, who are never satisfied with the gas, and never would be satisfied with any quality we could make.

Q. A large proportion of the complaints made at your office, are complaints with regard to fixtures, which you have a set of men to provide for?

A. The Boston Gas Light Company is the only gas company in the world which attends to the wants of its consumers. That is, in other cities, if any thing does not work well, if the burners, for instance, do not work right, or any thing is out of order, the consumer sends to the gas-fitter's. The Boston Gas Light Company, at the start, considered it the best policy to take care of the consumers, and it has had, from that time to the present, a corps of men, whose duty it is to attend to all complaints of this character. If the gas does not work right in any house, a fitter in the employment of the Company is sent to remedy the difficulty. We have a clerk, who is called the complaint clerk, who takes the orders, of all sorts and kinds, that come to the office. When a consumer finds that one of the cocks turns hard at his house, he sends to the Gas Light Company, and one of our men goes down to arrange that; and if there is any thing out of order with the service pipe, or if there is any thing which he don't understand, he goes to the office. Of course there are a great many complaints where there is no real difficulty, and a little explanation to the party is all that is necessary. But even that class of complaints is diminishing year by year, quarter by quarter, month by month.

Q. Have you a night force?

A. We have four men, part of whom are there all day and all night, the year round, to attend to any thing for which they may be called upon.

Q. No charge is ever made for these alterations of fixtures in a house?

A. No charge is made by us except for the gas which we sell.

Q. Now will you explain the system of distribution by gas-holders, and the circumstances which led you to adopt it?

A. The system of distribution is simply this: There is a large gas-holder at the works, into which all the gas that is made is put, which acts as a governor of the whole distribution. From that gas-holder, the gas passes into the other gas-holders scattered about the city. The Camden Street gas-holder, the West, in Charles Street, the North (which is the governor), and the holder in Hull Street, are telescopic gas-holders, with two sections. The Federal Street is a telescopic gas-holder with three sections. The sections of these gas-holders are arranged at different pressures, with reference to the wants which they are called upon to supply, and to the power of the distributing gas-holder at the North End to fill them. To explain that: The upper section of the Camden Street gas-holder (which is the farthest from the works) takes the gas in preference to any other section or gas-holder in town; and so of the top section of each of the holders; they take the gas, of course, in preference to the other sections of the holders; so that, when all the holders are full, — a case which has never happened yet, because it has never been necessary to fill all the holders, — but at the time consumption begins, the North holder has its share of gas, and the other holders have their proportionate share of gas, to be delivered to the districts which are immediately about them. The theory of perfect distribution is perfect circulation. All of our mains are connected together, so that in case of the breakage of any large main, the lights in the city do not go out, the other holders take up the supply and keep the city lighted. The advantages of this isolation are, in the first place, safety — certainty of supply; and, secondly, a sufficient pressure, so that every consumer shall have the gas he wants, when he wants it. They are built, as every one knows, securely, with houses over them; most of them with fire-proof roofs; and so connected that, if any accident happens to one holder, the other holders will take up the work. To show the importance of that, I will mention, that some three or four years ago, when the South gas-holder on Washington Street (which no longer exists) was in use, by accident one evening, the valves were closed, without our knowledge, and without the knowledge of anybody at the South End; but the supply went on from the other holders to the South End, in precisely the same manner, so

that nobody knew that the South holder had been shut off. With regard to the location of gas-holders at the works, there are objections which I have never seen answered. There are some conveniences, but there are more objections, as it seems to me. Of course, there is the convenience of having all the gas-holders directly under the eye of the engineer. That is a great advantage; but we have secured it practically, by having sets of telegraph wires connected with each of our distant holders, so that when Mr. Giles sits in his office at the North End, in the evening, he knows precisely the condition of each holder, and whether it is doing its work or not. He knows as much about them as he could if they were there directly under his eye, and knows the quantity of gas in each holder at any moment.

Q. That is a self-registering telegraph?

A. Yes, sir.

Q. So that in a moment he can tell which sheets of each section are above water?

A. Yes, sir. How many thousand feet he has in each holder; knows the stock on hand. Then the danger from accident. Every gentleman, I suppose, is more or less familiar with that terrible misfortune which occurred at the Nine Elms station of the London Company, last summer, where, by a leakage, by the blowing out of the gas in the governor in the purifying house, an explosion took place, which destroyed, in the first place, one gas-holder containing a million feet, and in a second — in an almost inappreciable portion of time, another gas-holder, containing another million feet, which was 500 feet distant. Of course the company was left without any ability to supply gas.

Q. That accident was the direct result of the adoption of the "governor" you speak of?

A. Of the governor.

Q. (by the Chairman). And a large number of people were killed also?

A. A large number of people were killed. Those were two gas-holders, uncovered, in the open air, and in the works.

Q. (by Mr. Jewell). Something has been said about covering gas-holders. Will you state the importance of having them covered?

A. In this Northern climate, we find a very great advantage

from keeping the gas-holder covered, not only as a protection from the freezing of the cups and the water in the tank, but also with regard to keeping an even temperature; so that, with a covered gas-holder, the gas is not subjected to the great changes which it would be in a simple iron vessel, exposed to the air; and we think we are enabled to deliver a better grade of gas in consequence. Besides that, they are situated in different parts of the town away from the works, and they are kept safe from all nuisance by building around them, so that a gas-holder is generally considered a pretty good neighbor.

Q. They are no objection, as a matter of fact, to the neighborhood?

A. I think not. At the time the Charles Street gas-holder was built, or rather, before it was built, I went to the gentlemen who lived in the vicinity and said, "Now, we propose to do this thing. We propose to build a gas-holder, and we want you to go and see what a gas-holder is, for if you remonstrate against the placing of one in this part of the town, probably your remonstrance would be sufficient to prevent our building it here." A Committee, of which Mr. Paul Adams was chairman, went to see the gas-holders, and they came to the conclusion that there was no possible objection to our building one there. We did build there, and I think the gentleman on my right [Alderman Davies] built some of the houses which are directly in front; and I have been told that those houses are now occupied by some of our best citizens who are entirely satisfied with the gas-holder as a neighbor, — Dr. Holmes, Mr. Derby, James T. Fields, and other gentlemen whose names I do not recollect.

Q. What is the capacity of your gas-holders away from the works?

A. The Federal Street, say, in round numbers, has a capacity of little over 450,000 feet; the Charles Street, a little over 300,000 feet; the Camden Street, 400,000 feet; and the Ferdinand Street, now to be built, about the same.

Q. Will you state what this new one on Ferdinand Street is going to cost you, exclusive of land?

A. The contracts are not yet signed, and of course I cannot say. I am hoping, very much, that bricks will take a different condition from what they are in at present, but I am afraid it is going to cost over $125,000.

Q. (by the Chairman). What would one of the same size have cost previous to the war?

A. The North gas-holder cost us about $90,000. I presume this will cost $150,000.

Q. What did the Camden Street cost?

A. About $125,000 in 1864, exclusive of land.

Q. (by Mr. Jewell). As a matter of proper administration in this climate, and for protection, you think these covers are necessary?

A. I think them a very important assistance. In fact, I have never seen a gas engineer who has not said he would like to have houses over his holders, if he could get them built.

Q. (by the Chairman). Is there any trouble in having them built in New York?

A. The Manhattan Company in New York have some housed.

Q. (by Mr. Jewell). Will you state now, what is the effect of your gas-holders, situated on the outskirts of the city, with regard to equalizing the pressure, and how they produce that effect?

A. They all work into the heart of the city. They are connected by a series of large mains. Our first plan of distribution was to have a large central holder, which should be the governor, in Mason Street. That we undertook to do about the year 1853, but were prevented by the people in the neighborhood, who had their fears very much excited from an inspection of the condition of the South gas-holder. They feared it might be a nuisance and opposed us, and of course we were driven away. Then we had to go to the outskirts, and dot round the city with gas-holders, which should work to the central main in Washington Street, connecting with each other and with the general distribution.

Q. As a matter of fact, you have a large gas-holder within five thousand feet of every consumer in the city?

A. I believe so.

Q. So that your means of distribution are equally as good, if not better than, those described by Col. Roome, as possessed by the Manhattan Company?

A. Quite so.

Q. What is your experience with respect to those gas-holders as to their effect on leakage?

A. Well, the testimony, of course, of all gas engineers, as well as the results of common sense, would indicate that the higher the pressure upon the main, the greater the amount of leakage. Our leakage is less than that of the New-York and Philadelphia works, judging by what Col. Roome stated the other night his own leakage to be, and by what the published reports of the Philadelphia works state theirs to be. Our leakage last year (1865) was $9\frac{8}{10}$ per cent. That is about the same as the year previous, when, I think, it was ten per cent. I use the term "leakage" in the sense in which it is commonly used by gas engineers, as the amount of gas unaccounted for; gas burned at the works, gas lost by condensation, gas stolen, gas consumed by the public lights more than is set down to the public light account.

Q. And you found, last year, that all these items together resulted in a loss of $9\frac{8}{10}$ per cent?

A. Yes, sir.

Q. Is it not desirable, as a matter of economy on the part of a gas company, to have such a system, as shall make as low a grade of pressure as possible, consistent with the delivery of an abundant supply of gas, by reason of the danger of leakage at high pressure?

A. Precisely. It is the object of a gas company to be able to deliver to every consumer all the gas he wants at any time he wants it, whether at the hour of greatest consumption, or at the consumer's convenience. Of course, if the gas manufacturer delivers it at too high a pressure, it is his own loss. He must, then, work at as low pressure as he can, consistently with obtaining this result; and the tendency of a gas company, of course is to work at the lowest pressure possible, because the amount lost by leakage will then be the lowest. In order to prevent that in London, where great complaints of an insufficient supply of gas existed, a provision of law was made that no gas company should work under a pressure of less than one inch, so that everybody should have gas enough.

Q. (by Mr. Curtis). Why did they run it down below one inch pressure in London?

A. Because their pipes were very leaky.

Q. (by Mr. Jewell). Will you now state to the Committee, generally, the size of your large mains, and how they go from your works so as to insure a perfect supply?

A. There are direct connections between the works and the gas-holders which form the centres of distribution. There is an eighteen-inch main, which leads directly from the works to the East gas-holder in Federal Street, with twelve-inch mains branching off on Washington Street at Summer Street. Then another eighteen-inch main goes from the works to Dock Square, there connecting with a twelve-inch main leading directly to Camden Street. Then another twelve-inch main runs to Charles Street, across Charles Street, through Pleasant Street, and connects again with that twelve-inch main which goes to Camden Street. Then on the east side of the city, a large main passes through Commercial Street. So that you have large mains in the centre, and large mains on the exterior of the city.

Q. (by Mr. Hyde). In speaking of working gas at a low pressure you said there was less waste. Have you ever made any estimate of how much you gain in the sale by working at a high pressure? Of course gas burns faster under a high pressure, and the company sell more?

A. We should not make any gain because the consumer regulates his own consumption by turning the cock when he finds he is burning too much.

Q. But as a matter of fact, if it is very high, it is more difficult to regulate, and more is consumed?

A. If it is very high, and the burner remains the same, then there is a larger amount burned. But a person instantly sees that the pressure is too great. If it is a fish-tail burner, it whistles; if a bat-wing it throws a large flame; if an argand, it streams above its chimney, so he at once controls that. It is no advantage to the gas company to put on a high pressure, because the consumer stops it.

Q. (by Mr. Jewell). I suppose Mr. Hyde wants to know, as a matter of fact, whether an increase of pressure won't produce on an average increase of consumption in a city, and whether that would not be desirable for a gas company.

A. There would be certainly a large increase of consumption by the public lights, but that would be waste. Of course, no well managed gas company desires any consumer to burn one foot of gas more than he requires for his convenience, and of course will adapt the pressure under which its gas is delivered to the most eco-

nomical result, so far as it can. You must bear this in mind always, that the pressure must be such that the consumer shall have all he wants and when he wants it. If he wants to light up his whole house, he must have enough to light every burner; of course I am unable to say how large a loss it would be to our corporation provided we worked at a very high pressure. That we have never done, and therefore I am unable to say. But of course it is evident that we do not work under high pressures when our whole loss of gas unaccounted for is less than ten per cent.

Q. (by the Chairman). If you desire to burn poor gas, you must burn under a higher pressure, musn't you?

A. No, sir. The greater the specific gravity, the greater pressure it will bear.

Q. Don't you require a less pressure for a rich gas?

A. You can burn a rich gas under a moderate pressure of course; but you cannot move molasses through mains as fast as you can water under the same pressure. One is a heavier substance than the other. So it is with gas. Gas of 0.400 will move under a lighter pressure than gas of 0.500.

Q. The question is whether gas coming from a meter under a pressure of 2½ inches, cannot be economized to the consumer by taking off that pressure behind the meter.

A. There is no objection to that.

Q. Can it not be done better there than by turning the faucet near the burner?

A. I think myself it is better to turn the meter cock. That we always advise.

Q. (by Mr. Curtis). Suppose you have a higher pressure than is necessary, does it not tend to condense the gas as it goes through the dry meter, which gas, when it comes out, again expands, and which would be in favor of the consumer?

A. That would be hardly calculable. I could hardly make an estimate of that.

Q. (by Mr. Jewell). What number of miles have you of street mains?

A. About 85.

Q. What was your production of gas last year?

A. Our production was 373,000,000 cubic feet.

Q. About what is the number of your consumers?

A. Our present consumers are about 15,500, I should say, in round numbers.

Q. The number of meters set?

A. I think the number of meters set on the first of December was 15,900. We don't count a meter a consumer, as they do in some places.

Q. (by the Chairman). Do you know how many miles of mains there are in Philadelphia?

A. I cannot tell from memory. The Reports will tell.

THE CHAIRMAN. It is said to be 475.

WITNESS. That covers all the environs of Philadelphia too.

Q. (by Mr. Jewell). What is your maximum consumption?

A. Our largest consumption has been 1,975,000. That was this month.

Q. Now will you state to the committee what the capacity of your works is, as compared with the demand?

A. Every gas work, of course, must anticipate the demands that may be made upon it.

It cannot work up and overtake the demand as fast as it comes; it must be ahead of it. I should say, as a general rule, that every gas work ought to be a year before the demands that are made upon it, so that in case of any accident, there may be a reserve upon which it can fall back. For instance, if we have a certain number of retorts to-day in use, if by any accident to a gas-holder, we should require an additional number of retorts, we should have them all ready to fire up — as is the case.

Q. You have gas-holders and street mains enough for a largely increased consumption?

A. We have.

Q. And your retorts are about a year in advance?

A. Our retorts are more than a year in advance. We have just finished a new retort-house, which we hope will carry us two or years in advance — depending of course, upon the condition of the city, as it may be left by the progress of business.

Q. At what price do you sell your gas?

A. We sell our gas to the private consumers at $3.25; at least, we sell gas by meter at $3.25; for the public lights, at $2.50.

Q. How many public lights are there, as near as you recollect?

A. Not quite 2,900.

Q. These prices you have named include the tax?

A. Yes.

Q. That is you pay the tax, and do not charge it to the consumer in addition to these prices?

A. We pay the tax.

Q. (By the Chairman). Don't you call that quarter of a dollar in addition to the cost of the gas?

A. It goes into the cost of the gas, certainly.

Q. Didn't you put on that quarter after the passage of the law?

A. We did, when the law was passed, add 25 cents to our bills, but we have struck that out, and now simply charge a round sum.

Q. You deemed that a tax by the General Government?

A. We did.

Q. Last year the tax was 30 cents a thousand?

A. Yes, sir.

Q. (by the Chairman). Was not that tax imposed upon the consumers of gas at the request of the Gas Companies of the United States?

A. Not of the Boston Gas Light Co. Mr. Roome stated why it took place. It was put on for the purpose of assisting those companies which were limited by their charters as to the price at which they should sell their gas. Mr. Roome was more largely interested than any one else.

Q. Didn't he represent the Boston Gas Light Co. when he went to Washington?

A. No, sir. We had no connection with him.

Q. You had no objection to receiving it, of course?

A. Well, sir, it is a part of the cost of our gas.

Q. (by Mr. Jewell). There is nothing in your charter to limit your price?

A. No, sir.

Q. Therefore whether you were allowed by law to add the tax to your bills, or whether you charged an increased price in your bills, the result is identical to you?

A. Yes, sir.

Q. Now, will you state to the Committee what your arrangements are with the city of Boston in regard to the public lights?

A. The arrangement of the city with the Gas Co. is simply this: that they are to furnish five cubic feet an hour to each burner, for which they receive one cent and a quarter, which is the same as $2.50 a thousand. They light, extinguish, and clean the lamps, paying therefor to the men employed for that purpose the sum which the city allows them for the service. The lamps are lighted by a card furnished by the City Superintendent of Lamps, and the lighters are directed to light such extra hours as by reason of overclouding of the moon the streets may be considered dangerous for travel by horse or on foot. I think that is the reading of the agreement with the city. The result is, that the regular number of hours in a year is about 2,700, I think, and they light 100 or 150 extra hours, according as storms happen or the moon is obscured.

Q. Who fixes the size of the burner?

A. The city delivers to us the burners.

Q. Five feet burners?

A. Yes, sir.

Q. And those burners are put on and kept in order by the men you employ?

A. Yes, sir. We have nothing to do with furnishing the burners. The burners are given to us, and we put them on.

Q. (by the Chairman). You employ the men, and pay them?

A. We pay them what the city pays us.

Q. They are in your employ?

A. In that sense they are. We get no advantage from that. We pay them what the city pays us.

Q. (by Mr. Jewell). Won't you state what improvement this is on the old system?

A. Under the old system, the public lamps were lighted by the watchmen who were employed by the city, and not directly responsible to the Gas Co. People over whom the Gas Co. had no control were placed to take care of its property. They were not responsible to the Gas Co., and in consequence, no system of military order could be established in the management of the lamps. Every lighter lighted, generally, according as he was directed by the city, but it was of no consequence to him whether he lighted half an hour early or half an hour late, or whether the lamp burned an hour or two hours after daylight, so long as he ren-

dered the required number of hours as burned. The result was, a large loss to the company. In conference with the Mayor, it was seen that the true way was, to put the public lamps in our hands, and hold us strictly responsible. That change was made, and a time-card furnished to every policeman, with directions, if a lighter did not light or extinguish his lamps precisely at the time specified by the card, to report him to the Chief of Police, and be reported to the Superintendent of Lamps, so that the city had a check on them, and under that arrangement, the department has been managed to the satisfaction of all parties.

Q. Under the old system, the neglect of the lighters told against the Gas Co.?

A. Very much so. If a lighter kept his lamp dirty, or lighted at improper hours, the Gas Company got the reputation of not doing a thing well which they had no control over. The result was, to make the Gas Co. directly responsible for their work, and the arrangement has been a satisfactory one.

Q. By the present method of giving cards to the police, they are able to keep watch over the lighters employed by you, and see that the lamps are lighted in season, and not extinguished before the hour?

A. Precisely, sir.

Q. So that, under the present system, if the police do their duty, there can be no loss to the city?

A. No, sir. Then, in order that there may be a thorough check upon the doings of these lighters, they are required to report at the office of the Gas Co. every Saturday, any hours of extra lighting beyond the card which may have taken place, and our Superintendent then requests the City Superintendent to see if they are correct, and if they are, then they go upon the record.

Q. (by the Chairman). Are not the same consequences likely to ensue with regard to the city interests that happened before with reference to the interests of the Company; that is, the thing be reversed?

A. I don't see how the city is harmed, in any particular. The city has its agents to see that we do our duty.

Q. Who are they?

A. The Superintendent of Police and the police. The police are required to report every neglect on the part of the lighters. It sometimes happens that a lamp-lighter meets with an accident,

perhaps falling from his ladder, and is unable to go on with his work; and in such cases, a report has been made to the office by the police, and a substitute has been put upon the district, and the work goes on regularly.

Q. Have you any idea that the policemen take any note of this?

A. No policeman ever came to me to make any report; but we have an Inspector of the Public Lights, and the information must come to the office.

Adjourned to Wednesday, at six o'clock, P.M.

WEDNESDAY, Dec. 19, 1866.

The Committee met shortly after six o'clock, and the direct examination of Mr. Greenough was resumed.

Q. (by Mr. Jewell). We were on the subject of the public lights when the examination was broken off. Are you able to give a statement of the comparative cost of the public lights in Philadelphia and in Boston?

A. In Boston, in the year 1865, there were 2,827 public lamps, each of which burned 2,728 hours. There may have been a few less or more. These are the figures made up in the Auditor's Report. They are not the average, any more than the figures given in the Philadelphia Report. The city paid for gas last year $98,035.11 — being an average of $34.68 per lamp. For lighting, cleaning and extinguishing the lamps, the city paid to the Company, who paid it over to the lighters, $15,937.84 — being $5.64 paid for lighting, cleaning and extinguishing each lamp, — making the amount paid by the city for gas and lighting $113,972.95, or an average of $40.32 per lamp. I may state here, in this connection, that the public lights are lighted a very different number of hours in various cities. In London, they light 4,304 hours, their latitude being considerably to the North of ours, and their nights longer, necessarily, in winter. In New York, they light 3,833⅓ hours — lighting all night, in the same manner that they do in London. We light here by the moon, with such extra hours as may be necessary from storms or darkness happening, when the moon is in the ascendant. I have here the number of extra hours for the last four years. In 1862, we lighted 192 extra hours in the whole year, on account of dark nights. In 1863, 177 hours. In 1864, 80 hours. In 1865, 85 hours. In 1862,

each lamp burned 2,926 hours; in 1863, 2,878; in 1864, 2,707; and in 1865, 2,764; — making an average for the four years of 2,818 hours. I before stated, that the lighting of the lamps according to the Auditor's Report, was 2,728. There you will notice a discrepancy; but the city's year is from April 30 to April 30, while our year is from the first of January to the first of January, so that I was obliged to take the figures from the Auditor's Report of the number of lamps in use at that time. In Philadelphia, by the report which is here before us, I find that there were lighted, in the year 1865, 7,405 lamps (p. 53). The city paid for the gas, lighting, extinguishing and cleaning, $434,489.03 (p. 18); making the sum of $58.67 paid by the city of Philadelphia to the Trustees of the Gas Works for each lamp.

Q. (by the Chairman). Lighting all night?

A. No, sir; 2,113¼ hours, by the table which I have here, which is the table of the lighting of the Philadelphia lamps. And whether they were lighted that number of hours is very doubtful. I have before me a report made to the City Council of Philadelphia on Thursday evening last, by a Committee who were called upon to investigate the condition of the Gas Works. This was published in all the papers of Philadelphia last Friday, I believe, or, at least, in all the principal ones, but this paper which I happen to have is the Daily News of December 14. In this report is the following paragraph: —

"The facts about the street lamps are extraordinary, and show that the lamps for several weeks were lit an hour later and put out an hour earlier in the darkest nights and the most dangerous condition of the streets, in December, 1865, than they ought to have been, by reason of a short supply of gas; and that the city was for a long time deprived of the full light she was entitled to, mufflers being put upon the burners, which were subsequently disposed of as old brass, causing a loss of several thousand dollars."

So that we perceive from this statement that it is not probable that they were lighted even 2,113 hours. And yet, with that payment of $58.67 per lamp, you will see, on page 4, that they give, as the loss on their public lighting, $191,650.21. I hardly think it is worth while to pursue the analysis of these statements in regard to the Philadelphia lamps much further. The farther you go, the more extraordinary the statements appear. At any rate, we have the fact that they paid $58.67 per lamp.

Q. (by Mr. Jewell). For about 600 less hours than we burn, they paid about $18 a light more?

A. $18 a light more; and any gentleman who has ever been in Philadelphia and in Boston can judge by his own eyes as to the relative quantity of the gas burned in our lamps and theirs. Of course, I have never seen the Philadelphia lamps tested, but I think a moderate estimate would give at least 25 per cent more per hour in Boston than in Philadelphia.

Q. The amount burned in New York, I think, is three feet per hour?

A. Three feet. The New York lamps burned last year 3,833½ hours each, and in the account which Mr. Roome said was unsettled, they have charged $53 per lamp for that service.

Q. Is there any thing connected with the use of the public lamps which will furnish a test of the quality of the Boston gas, as compared with the New York and Philadelphia gas?

A. I don't know that I can say that the test which I am going to mention is an absolute test of the grade of the gas, but it is a very extraordinary fact, whether it is to be referred to the grade or any thing else. In the year 1859, I think (it may have been 1860), upon a severely cold night which occurred, when the temperature was far below zero, every public light in New York, Philadelphia, Baltimore, and Washington, went out. On that same night, with the temperature at a lower point, in Boston there were not five public lamps which were put out by the cold. That fact was mentioned in the papers of the day, and was a very striking one. If it did not indicate that our gas was of a better quality, at least it indicated that for some reason or other, the Boston gas stood the temperature while others did not.

Q. (by the Chairman). Was not the reason of that because, by reason of the milder climate of those cities, the pipes are not so well protected as in Boston?

A. The service pipe here may be better protected, but the point where the public lights usually freeze is where they issue from the ground.

Q. (by Mr. Jewell). The price of the public lights was $2.50 per thousand, and out of that you paid 30 cents a thousand to the United States?

A. We did.

Q. Making the next proceeds to the Gas Company of the gas burned in the public lamps $2.20 a thousand?

A. At five feet delivered. We delivered more, but that was all we agreed to charge for, five feet; and we only charged for five feet.

Q. Is there any reason why the city of Boston should have gas cheaper for the public lamps than private consumers?

A. That formerly was a mooted question. It was supposed that certain privileges were granted to the Gas Company whereby the city could charge to the citizens who used the gas any difference in the price made in the city's favor on the public lights. Of late years, in the great cities of Europe, the public lights are charged at the same price as private consumers. The same custom prevails in New York and Philadelphia. I don't know how it is in cities further South, but in Philadelphia and New York the price is intended to be uniform.

Q. Are you aware of any city except Boston where the public lamps are supplied at a different rate from those of private consumers?

A. Oh, yes; there are three or four cities still remaining in that condition.

Q. Is that, in your judgment, a just system to the consumers of gas?

A. It is not, because the gas cousumers are required to pay for any loss on the difference in price to the city. If any loss is made upon the public lights, of course the Gas Company must charge it to the private consumer. A Gas Company must live, like any other corporation.

Q. It is a relief to the tax paying citizens, at the expense of the general consumers?

A. It is.

Q. Are you at liberty to state the actual cost of your gas to the Company — the details of the cost of your gas?

A. I am not. I hardly think that question should be put to me, because that is a matter which does not belong to me. The question of the cost of the gas is a question for the stockholders of the Boston Gas Light Company, and not for me. So far as I am concerned, it is a matter of trust to me, which I should not communicate to a stockholder or anybody else; it is a part of the business which I carry on.

However, with regard to that matter, I am perfectly free to

state certain points, which will perhaps give sufficient information to the city upon the subject. I can show you a little what our general results have been. In the autumn of 1864, we for the first time failed to earn a dividend. The same thing continued for the first six months of 1865 — we did not earn a dividend. In the year 1865, gold fell, and for the last six months of 1865 and the first six months of 1866, we were enabled to earn dividends. While we were considering whether we should not be warranted in reducing our price for gas, the Government put a duty of $1.25 per ton upon coals, which had hitherto been free; so that, as we were unable to know what our gas would cost, we could not, of course, make any change in our price. We are in a very peculiar position — that of a manufacturing corporation which is obliged to fix the price of its commodity before it knows what that commodity will cost. I know of no other manufacturing corporation which labors under the same difficulty. We are obliged to fix the price at which we will sell our gas, before we know what the material is going to cost us. Of course, gentlemen understand that we begin to lay in our coals for the year in June, and get through in December, so that our coals are laid in during the last six months of the year. Our labor, however, extends through the whole year, and with the shifting price of gold, we have no means of knowing, absolutely, until our accounts are made up, what our gas is to cost. We do not know, for the year 1866, and we shall not know, until our accounts are made up, which will be in March, whether we have made or lost in the preceding six months.

Q. While we are upon this subject, will you state what has been the net cost of coals this year, as compared with 1865?

A. That I cannot answer, because our coal contracts are not settled, and will not be settled, probably, for thirty days yet. I can give the original price, and can give you the duty, of course.

Q. State, then, as far as you can, those details.

A. We were enabled to purchase this year, of the Pictou Co., by making a large purchase, our coals at 25 cts. a ton, in gold, less than the previous year; so that, instead of paying 2.50 in gold, we pay $2.25 in gold. Then we add the duty of $1.25, in gold; making $3.50 per ton as the cost of our coal, in gold, instead of $3.75, as it would have been if the General Mining Association had made no concession.

Q. So that your Pictou coal costs you a dollar more a ton in gold this year than last year?

A. Yes, sir.

Q. (by the Chairman). How much in currency?

A. They have not been paid for yet. The terms of the Company are 90 days, and we remit from time to time such sums as may be necessary.

Q. You make up the cost in currency?

A. We make up the cost in currency when the account is settled. Then we can average all our payments in gold.

Q. (by Mr. Jewell). Your cost in currency will depend upon the price of gold?

A. It will depend upon the average, when we get to the end. When we make our last payment, then we shall have the average gold price; and the lower gold shall fall (and I hope it will continue to fall), the better it will be for all parties. With Albert coal there has been no difference in price, except that we have had this duty to pay, which we did not have last year.

Q. Then the Albert coal has cost you $1.25 in gold more per ton than last year?

A. Yes, sir.

Q. If you are unable to give us the details of the cost, will you give us the average of your sales of gas during this past year?

A. There is no objection to that. Selling by meter at $3.25, and to the public lights at $2.50, with say $9\frac{8}{10}$ per cent lost by leakage, we average $2.84 per thousand feet as the amount received for the gas which we sold.

Q. Does that take into consideration the deduction you make to a certain class of private consumers?

A. It does not.

Q. Won't you describe what that is?

A. We make a deduction of five per cent upon the city bills, and we make a deduction to customers burning a thousand dollars a year, and paying their bills promptly, as the city does, in the early part of each month. The amount of this I must not state from memory, but it makes quite an item. That is not deducted, neither is the loss by bad debts deducted.

Q. But, assuming that you got $3.25 for every thing sold by meter, and $2.50 for the public lamps, the average receipt is $2.84?

A. Yes, sir; $2.84 per thousand, which we receive for the gas we make.

Q. Does this amount of $2.84 include all the taxes you have to pay?

A. Yes, sir.

Q. Out of that you have to pay your taxes?

A. Yes, sir.

Q. What was the amount of your City, State, and United-States tax per thousand?

A. They amounted last year to 33 cents and a fraction per thousand feet.

Q. So that your net receipts, independent of your five per cent deduction to certain consumers, and of your losses by bad debts was between $2.50 and $2.51 per thousand?

A. It was.

Q. (by Mr. Hyde). What per cent of bad debts do you find?

A. I have never calculated the percentage in a series of years. Of course, we suffer with the community. When the community is suffering from "hard times," as the phrase is, of course we lose more than in prosperous years. In New York, the system is to take deposits from consumers, or from a very large part of the consumers, so as to prevent this loss of bad debts; but we deal with a very different population from what they do. There is a very large number of transient people who come and go from New York; but we have never felt that with a population so permanent as ours, it was advisable to require deposits. We prefer to take the risk. Sometimes the bad debts amount to one and a half or two per cent on our sales.

Q. (by Mr. Jewell). You do require deposits in some instances?

A. To a small extent. In cases where parties are tenants at will, where their landlords will not trust them with a lease, we don't feel that we ought be called upon to trust them for their gas, and we take from such parties a deposit.

Q. What is the gross amount?

A. It never amounted to more than a thousand or two thousand dollars a year.

Q. Do you know how much it amounts to in New York?

A. That I don't know. The last time I was told, it amounted to $400,000.

Q. That they allow interest on, so as to make it just?

A. That they allow interest on.

Q. Now, have you any doubt, as a matter of fact, that you make loss on the public lamps?

A. I have no doubt of it.

Q. (by Mr. Hills). Was not the failure to make dividends in the year you have named owing to extensive additions to the works?

A. No, sir; that had nothing to do with it.

Q. (by Mr. Jewell). The dividend was made as usual?

A. Yes, sir; but it was not earned.

Q. (by Mr. Hills). In case you build a large gas-holder, what account does that go into? Does not that go into the yearly account?

A. No, sir.

Q. (by the Chairman). Do you add the United States tax, in fixing the cost of your gas at $2.84?

A. That is not the cost of the gas. That is what we receive for all the gas sold.

Q. You do not give the cost of it, then?

A. No, sir.

Mr. CURTIS. We do not give the cost, but we have said that selling at $2.20 to the city, we lose, and that the average amount we receive is $2.51, and we make a profit. That we think is sufficient data for the Committee to judge from.

Q. (by the Chairman). You have not given the actual cost of the gas?

A. I have no right to give it.

Q. You have it recorded upon the books of the Company?

A. There is no record upon the books of the Company of the cost of gas.

Q. You appear here as the representative of the Company?

A. Certainly I do.

Q. They sent you here for that purpose?

A. I don't know as I was sent here. I came here in order that they should not suffer any harm. Nobody asked me to come here.

Q. (by Mr. Jewell). What is the capital stock of the Gas Company?

A. $1,250,000.

Q. Will you state how that amount represents the cost and value of your works?

A. The amount of $1,250,000 is the amount of capital which has been paid in. It neither represents the value nor the cost of our works. Our land stands upon our books at the price which we paid for it. It does not represent the profits of the thirty years' business, since 1836, over and above the dividends that have been made.

Q. The small margins of earnings above the dividends, whatever they have been, have been used in increasing the plant, and are not represented in the capital stock?

A. No, sir; the profits have never been capitalized.

Q. And all these residuums have been used to increase the plant, and are not represented in the capital stock, and no dividend is paid on them?

A. No, sir.

Q. They increase the value of the machine which you use, to earn your profits, and yet the public is not taxed in the way of dividends to pay the interest upon it?

A. That is correctly stated.

Q. Will you give the valuation of your works by the city?

A. I hold in my hand the list which was handed me by the Assessors of the valuation of our property. The real estate and machinery belonging to the Gas Company are valued at $2,047,100, upon which we are taxed for the present year, 1866, $26,612.30.

Q. Have you any surplus in the form of money?

A. We have not.

Q. Does the Company owe any debts at this moment?

A. Yes, sir. I should say, in round numbers, $200,000.

Q. Then your Company is making use of property valued at two millions of dollars, on which to earn a ten per cent dividend on your nominal capital?

A. By the statement we are so doing.

Q. Can you tell what have been the dividends since you became connected with the Company?

A. Ten per cent regularly.

Q. Payable quarterly?

A. Payable quarterly.

Q. Has there ever been an extra dividend?

A. Never since I have been manager of the Company. I find,

on looking over the records, that they paid 11 per cent one year; somewhere about 1841, or '42.

Q. Has there ever been any stock dividend?

A. Not since I have been connected with the Company. Years before, I believe they called in an amount of stock, on which an allowance was made for profits, but I found, after I came to be the manager of the Company, that no allowance should have been made, and that amount had to be replaced in cash from the earnings of the Company.

Q. State whether the quality of your gas has, during your whole time been uniform; — that is, whether it is the policy of the Company, to make a uniform quality?

A. We have endeavored to make a uniform quality of gas, so that people who burn gas should know what to do; that they might rely upon having, not only as good an article, but an improving article. We have endeavored to make our gas just as carefully to-day as if we were making it for the first time; taking just as much pains to have our whole manufacture complete and perfect as if we were making it for the first time to-day.

Q. Will you state the prices at which gas has been sold at various times during the history of the company?

A. The price in 1841 was $5.00. It was reduced on the 1st of January, '44, to $4.00; on the 1st of January, '47, to $3.50; on the 1st of January, '51, to $3.00; on the 1st of October, '52, to $2.50; on the 1st of April, 1860, to $2.25. It was then raised, on the 1st of January, 1864, to $2.50; on the 1st of July, 1864, to $2.75; on the 1st of October, '64, to $3.00; on the 1st of January, '65, to $3.25.

Q. Then you went through the first three years of the Rebellion without any increase of price?

A. Yes. We hoped to be able to go through, but we found that the values of all commodities had changed, so that it was impossible.

Q. And yet, with all the increase of prices you had made, you were not able to earn dividends in the latter half of 1864?

A. The latter half of '64, and the first six months of '65.

Q. (by the Chairman). But you say you have made ten per cent dividends every year?

A. Yes, sir.

Q. Why didn't you earn it at that time?

A. Because the amount of our receipts didn't come up to the amount of our expenses. That is the reason why we didn't earn it.

Q. What was the character of your expenses?

A. The ordinary expenses of gas-making: nothing extraordinary.

Q. No collateral circumstances about it?

A. Nothing at all, merely the increase in the cost of coal, labor, and every thing we had to do with.

Q. (by Mr. Jewell). Your Company supply meters without charge?

A. We do so.

Q. And I think you make no charge for service pipe?

A. That never has been our custom.

Q. At a certain period in the history of the Company, they did charge for meters?

A. So I have been told. It is not within my knowledge. It was before my connection with the Company.

Q. About 1843 or '45, wasn't it?

A. Yes, early in the forties.

Q. Do you know any other company that supplies service pipes without charge?

A. I don't remember any at this moment; and it is not usual; it is not the custom.

Q. Do the companies usually supply meters without charge?

A. The custom is different in different cities. Mr. Roome stated the other night that they charged meter rent. I think it is an American custom rather than an English custom, not to charge meter rent. It is expressly provided, as gentlemen will see by reference to the Metropolitan Gas Bill, that an arrangement is made for all the companies to charge meter rent in that.

Q. Will you state what the policy of the Boston Gas Light Co. has been with regard to the prices of gas and dividends, since you have known it?

A. From the time that I became connected with the Company, in 1852, down to the present time, the policy has been uniform. We have felt it to be the permanent interest of the Company not to make large profits. We have felt, that so long as we solely supplied the city with gas, if we had rights, we also had duties

to perform to the community; that we were bound to give them a good article of manufacture, and sell it at a fair price; and when our profits would enable us to see our way clear to make a reduction, if the condition of affairs appeared to be permanent, to make that reduction; and you will find that we went on reducing from year to year, without any public appliances, the price of our gas. It is our policy to continue the same treatment of our consumers; and the moment we can see our way to a diminution in price, we shall make that reduction.

Q. Has there ever been an instance where the quality of your gas has been changed simultaneously with the change of price?

A. Never.

Q. What is there in the manufacture or consumption of gas which makes it rather for the interest of the Company to reduce the price?

A. A reduction in price is usually succeeded by a large increase of consumption. Upon the year that we made our reduction from $3.00 to $2.50, our receipts were larger at $2.50 than they had been the year before at $3.00.

Q. And of course the consumption very much larger?

A. The consumption increased. We had, that year, the largest increase we have ever had, — 33⅓ per cent. Upon a reduction of 20 per cent in the price, we increased 38⅓ per cent in consumption.

Q. And that of itself is an element to be taken into consideration?

A. That is an important element.

Q. And the fact of the decrease makes complaints less and less?

A. Certainly; it makes fewer complaints as to the size of the bills.

Q. I think you stated in one of your answers, that the question of a reduction came up in your mind some time in the year 1866, when you found you were earning a dividend?

A. Yes, sir, in the early part of 1866.

Q. And that a reduction was prevented by the fact of this duty being put upon coal?

A. Yes, sir. There are two taxes which may be, necessarily or unnecessarily, levied upon a Gas Company in New England. I say New England, because the two apply more particularly to New England than the whole country. One of them applies to the whole country; the two together apply to New England. This

is the only country in the world in which gas is taxed. In France, England, and even in the despotic governments of Europe, gas is not taxed. Then again, there is no reason in the world why coal should not be free. Coal is a matter which comes home to every man; it warms his house, and lights his house. Cheap coal makes cheap steam, and cheap iron, which are the foundations of the material prosperity of a country. We now pay a duty of $1.25 per ton, in gold, to the Government, upon Provincial coals. The object of that duty, I may say, so far as I understand it, is not revenue to the Government, but that one or two States in the Union shall be enabled to convey their coals to tide-water, so as possibly to sell them to New England. In other words, to compel New England to buy coals that are mined the other side of the Alleghanies. In that respect, the policy has failed. New England does not buy the coals it was intended she should be compelled to buy. Those two items together make, upon a production such as ours, about 50 cts. a thousand, which is added to the cost of our gas. We hope to see that shortly removed. It depends, however, upon conditions which are beyond our control, of course.

Q. And the hope of a reduction in price to the extent of 50 cts. a thousand, depends upon the settlement of these two questions?

A. And the fall of gold. The fall of gold, carrying with it the fall of provisions, and all the necessities of the working-man; and with that, of course, the price of labor will fall.

Q. How does the price of labor and materials in 1866 compare with 1865?

A. I should say they were higher in general than in 1865. Some sorts of labor are no higher; other sorts are a good deal higher. Skilled labor is a good deal higher than in 1865; building materials are higher than in 1865; iron is higher; all the materials which enter into the cost of gas and the manipulation of gas.

Q. (by the Chairman). Is yard labor any higher this year than last?

A. Yard labor is about the same. I mentioned that skilled labor was higher, but not the other sort. Common laborers are higher. We are paying more for street labor than in 1865, — for the men who dig up the streets.

Q. The city pays for that, I believe?

A. I beg your pardon; the Gas Company pays for it.

Q. I mean, for the lamp service?

A. Precisely. The city pays for what work it has done for itself.

Q. (by Mr. Hills). You say that the cost of extending the works is not paid from the profits of the company?

A. That depends upon the character of the extension. The large gas-holder which we are now about to build, we shall borrow the money for, which will be capitalized at a convenient time. With the present manner in which we are carrying on our business, uncertain whether we shall make both ends meet at the end of the year, it is better for us to borrow money at five or six per cent, than to capitalize it at ten per cent; so that, in general, we prefer rather to borrow outside than to borrow of our stockholders at ten per cent.

Q. (by Mr. Jewell). Your system has been to pay ten per cent dividends to your stockholders?

A. It has.

Q. And if you raise the money by increasing your capital, you have got to pay ten per cent, unless you change your dividends, which, under the circumstances, you think you ought not to do?

A. Precisely.

Q. And so you are able to save four per cent by borrowing the money?

A. In this case, we hope to.

Q. (by Mr. Hills). Was that the case with the other gas-holders you have built?

A. The last stock we called in, I think, was in 1864, and that was called in with reference to the Camden Street holder, and some other improvements that we had then in progress.

Q. (by the Chairman). Then, in order to save five per cent to the company, you put a tax of ten per cent upon the citizens?

A. No, sir; the citizens save the five per cent as well as the company. If we are not obliged to earn five per cent more, it does not come out of the citizens.

Q. You must charge the citizens ten per cent in order to get the profits to enable you to pay your dividends?

A. When we capitalize, we charge the citizens ten per cent. We don't divide ten per cent upon that borrowed money. Sup-

pose, for instance, our capital is a million, and the question comes up as to whether we shall borrow $200,000 or capitalize it. If we capitalize it, then we have got to pay $20,000 to our stockholders on money borrowed from them, which we have got to earn to pay them; but if we borrow it at five per cent, we have got $10,000 to earn, and consequently there are $10,000 saved to the gas consumers.

Q. How much do you have as a permanent loan?

A. We don't have any all the time, because when we call in money, we pay off the loans.

Q. How long do you allow it to run?

A. That depends upon circumstances. If we can borrow from a savings bank on two years at five per cent, we do so, in preference to borrowing from a bank for four or five months. We pursue the same course as a merchant would in his business.

Q. (by Mr. Hyde). You must either capitalize it, or pay it out of the earnings of the Company?

A. Precisely. We don't capitalize our profits. We never proposed to capitalize our profits.

Q. Suppose this new gas-holder costs $150,000. Now you either capitalize that by issuing stock, or by calling in stock and paying for it.

A. We might capitalize any profits which we had on hand. Capitalizing is a phrase intended to express your putting into the form of stock any reserve of profit which you may have on hand.

Q. (by the Chairman). You increased your capital a million of dollars a year ago?

A. Oh, no. We were permitted to issue a million of dollars for our capital stock. In order then to cover our possible requirements for the future, we asked for leave to issue another million of stock from time to time, as it might be required, and of that additional million we have issued $250,000.

Q. You have issued that to the stockholders?

A. Yes, sir: but they have paid in precisely the par of the stock — what we have asked them to do.

Q. And all over goes to pay these debts?

A. Yes, sir. We have got to do one of two things; and substantially we arrive at the same practical result in either way. Suppose we issue $200,000 of stock and put it up at auction. That sells for whatever price you please. Then the money above

par for which that stock sold belongs to the corporation. In England, when such a sale of stock has taken place, that has been added to the plant, without interest. That is, the company has had it without interest, or it has been paid to the stockholders. It is just as broad as it is long. You give that money to the stockholders of the company, and they either take it themselves or add it to the plant. If added to the plant, it is given to the company without interest.

Q. (by Mr. Hyde). Suppose you borrow $150,000 on a temporary loan. Now, you have either got to remain in debt all the time, or pay it off out of the surplus earnings of the company, or let stock be issued to pay it.

A. Precisely; it must be either one of those three things. The debt must be paid in some way, either from the profits, or by the stockholders paying in the cost of the buildings. Our policy has been, for all these great improvements, to call in the money for them paid in at the time by the stockholders, and make new stock.

Q. Then why take a temporary loan at all?

A. Because upon new stock we are obliged to pay ten per cent.

Q. (by Mr. Jewell). As a matter of fact, the stockholders are desirous that these improvements should not be paid for out of the profits, but that new stock should be issued, are they not?

A. That has been the policy.

Q. Has it not been the uniform desire of the stockholders to have the stock increased, so that they might get stock on which they would receive ten per cent continually?

A. The pressure of the stockholders is to have more stock, of course.

Q. Whereas, the policy of the Directors has been to keep the plant as low as possible, for ease of management, and to satisfy the community?

A. Yes, sir.

Q. (by Mr. Hyde). If the Gas Company increases its capital to three millions, it is a great deal cheaper for the consumer to pay the interest on the stock issued, than to have the improvements paid for out of the earnings?

A. No, sir; the customer has only to pay the interest on the

smaller amount of stock. If we have a property that is worth three millions of dollars, and it stands at only one million on our books, and we pay dividends to our stockholders on only one million, you do not have to pay the interest on the two millions which we have not capitalized.

Q. Put it in this form: The Gas Company, say, has a million dollars of capital, on which you pay the stockholders ten per cent, and charge nothing over to the consumer. That is, you charge the consumer for interest, and charge ten per cent on the stock. You charge him not only on the principal, but you charge him enough to add to your capital two millions. In other words, you make him pay the interest on the capital, and then you make him furnish the capital.

A. No, sir.

Q. You make him pay the interest on the original capital, and then supply the interest on the increased capital.

A. No; if we earn two millions, we don't ask him to pay the interest on that.

Q. He pays the principal, if he does not pay the interest. A particular consumer has not paid it, but, as I understand you, it is spread over a series of years. Supposing the consumer has furnished that amount of profits to the Gas Company, by which they are enabled to have works costing three millions stand them in only one million, then who has got the advantage of the profits?

A. The consumer in the one case has got them, because the annual stipend on the cost of the gas is only charged upon one million; and in the other, the Company has got it, because it is added to their property.

Q. Supposing, for example, a stockholder commences with one share, and out of the earnings two shares have been added, so that the stockholder has three shares for his one share. Now, if you sell out and divide, your profits have trebled the stock out of the consumer.

A. That is all true. I admit that.

Q. (by Mr. Jewell). As a matter of fact, has the Boston Gas Light Company ever done any thing of the sort?

A. Never.

Q. (by Mr. Hyde). Is the Boston Gas Light Company over-taxed?

A. I should think not.

Q. Where has the increase come from?

A. The increase comes, to a large extent, from the rise in the value of our real estate since we bought it. That is the principal increase. A portion of it, as I stated before, from the accumulated profits of thirty years, which we have not capitalized, but which we have a perfect right to capitalize.

Q. They have been expended in the extension of the works?

A. They are represented in bricks and mortar, or in the depreciation of property.

Q. (by Mr. Jewell). The amount of savings, during the thirty years, has been a very moderate sum, compared with the increase by the rise in the value of property?

A. It has.

Q. (by Mr. Hyde). What is the class of property you allude to?

A. Land.

Q. Where located?

A. At the North End, South End, East and West End.

Q. Other than where you have gas-holders?

A. Nowhere else. The land upon which our various structures stand, and land in the vicinity that belongs to us.

Q. What has been the increase of value?

A. We began to buy in 1828 at the North End, at 37½ cents per foot.

Q. What part of the North End?

A. In Hull Street. The last purchase of land which we made, on Prince Street, cost $2.30, in about the same relative position as the land which, in 1828, we paid 37½ cents a foot for.

Q. (by Mr. Jewell). It has been said at some time during this hearing, that this Company has not exchanged its old meters as it ought to have done under the law. Will you state what is the fact on that subject?

A. It was said, by the Chairman, I think, in some proceedings which I have read, that there were 25,000 meters of the Boston Gas Light Company, more or less, and that only a very small portion had been exchanged and inspected. I find this statement by the Chairman, at the opening of this hearing last spring,—"There

are in the city of Boston 20,000 houses, and it is fair to state that there are 15 or 20,000 meters in Boston to-day, that never have passed inspection." And in another place it is said — "It is not an object for the Boston Gas Company to change 25,000 meters to-day, especially if they do not measure against them; but you take those 25,000 meters and examine them closely, and you will find the same defects that are found in Scotland." The whole number of meters in use on the first of October, 1866, was 15,478: the whole number in use on the first of October, 1861, was 12,903; this gives a total of new meters set since that time, for new consumers, of 2,575. But the whole number of inspected meters set from October, 1861, to October, 1866, was 11,072; so that, deducting from that number the 2,575 which were set for new consumers, we find 8,497 which have been called in, inspected, and reset.

Q. How many would that leave which have not been called in?

A. That would leave, not called in, about 4,500. It shows that we have called in at the rate of about 1,700 a year.

THE CHAIRMAN. What I stated was, that but very few of the meters that had been set previous to the enactment of the law had been inspected by the State Inspector. The point that I was making was, that if we had a City Inspector, the city would put upon him the duty of inspecting every single meter in use in Boston after he was appointed. The State Inspector does not feel it obligatory on him to inspect any meter that was not set previous to the passage of the law; and hence it was I reasoned that the city should have its own Inspector to go through the city and put his seal upon every meter. The law does not impose this duty upon the Inspector, any further than this: If I go to him with a complaint about my meter, it is taken to his office for inspection, and if found to measure against me, the Gas Company have to furnish a new meter; but if found to measure correctly, I have to pay all expenses.

WITNESS. The words you used are these: "Now, there are in the city of Boston 20,000 houses, and it is fair to state that there are 15 or 20,000 meters in Boston to-day that never have passed inspection."

THE CHAIRMAN. Never have passed the State inspection?

WITNESS. I have given you the facts. You say there are 15,000 or 20,000 meters that have not passed inspection. You

mean by that State inspection; and here are the figures to show that that statement is not correct.

Q. (by the Chairman). How many meters have you ever known to have been inspected that were in use previous to the enactment of that law?

A. Here are 8,497 meters which were in use previous to the passage of the law which have been inspected.

Q. They have been taken from the houses and inspected since the passage of that law?

A. Yes, sir.

Q. And that by the request of the consumers?

A. No, sir.

Q. When was that inspection made?

A. At different times according to our convenience. We called them in and had them inspected as fast as we could, and we shall go on until they are all inspected.

Q. And those were meters which your agent who went round from house to house found defective?

A. No, sir. There are various ways in which meters are called in. You may desire to have your meter inspected and reset. According to the law, no meter is to be reset until it is inspected. Of course, every termination of the tenancy of a person ends his account with the meter, and we cannot begin with a new tenant without having that meter inspected, and so it is called in for inspection.

Q. That was done for you own convenience?

A. No, sir. I beg to say, that the law has made the Gas Company no more correct than before. If any thing the inspection of the Gas Company was more minute before the passage of the law than now. Now, we have got a standard outside of ourselves, to which we can appeal. Before, we had to be our own standard. Exceeding care was therefore required; every thing must be right; so that we took the utmost pains to see that every meter was inspected before it went out, and every meter was also inspected by the manufacturer, and warranted to be of the accuracy required by us, within one per cent. We did not confine ourselves to two per cent; we required the manufacturer to furnish meters within one per cent; and all those meters were inspected and warranted by the maker before they were set, so that we had a double inspection.

Q. What I meant to be understood as saying in this matter is this: that there was nothing obligatory upon you to take a meter from a house and have it inspected.

A. Nothing but the desire to have things right.

Q. When the State Inspector came in, the meters went to him?

A. Yes, sir.

Q. The point is, how many of these meters have been brought to the State Inspector since the enactment of the law?

A. There is the number, — 8,497.

Q. Brought by the citizens?

A. No, sir, they have not been brought by the citizens.

Q. How many did you inspect at the request of consumers during that time?

A. No more than the general average. We went on as before, desiring to be strictly accurate. I suppose the whole number inspected at the request of consumers has not been more than a dozen or fourteen a year since the law passed.

Q. (By Mr. Jewell). And all the rest have been called in, in accordance with your own policy?

A. In accordance with our desire to have every thing pass under the inspection of the State Inspector; and the remainder will be called in as rapidly as possible.

Q. Will you state what is your knowledge in regard to the accuracy of the dry meter, and how generally that is used as the standard for measuring gas?

A. One of the earliest objects which attracted my attention after I became manager of a Gas Company were the meters in use. I found that it was a point of the utmost consequence that a Gas Company should have the best meter it could obtain, because it was obvious that if the gas was accurately measured to the consumer, it was no more than an act of justice on the part of the corporation. After obtaining the best information I could, I sent to England, in 1852, and imported a number of the Glover dry meters, which after careful trial were put into use; and from that time up to the present, our experience has been such with regard to the dry meters that they have pretty nearly supplanted all the wet meters which we previously had in use.

Q. How is it in other cities?

A. That is the case all the world over, — the dry meter is supplanting the wet meter. There is a passage here (in the report

of the hearing last spring) to which I wish to call the attention of the Committees. There seems to have been a meeting of the Scotch Association of Gas Managers in Edinburgh, a report of which was published in the Gas Light Journal, from which the Chairman read an extract, omitting, however, an important passage. The report says, "Mr. Whimster of Perth bore a similar testimony. He accounted for dry meters — which were used in shops, offices, ware-houses, &c., and standing idle during part of the summer — not working so well as those kept constantly in use, from the fact that dirt and tarry matters deposited on the rubbing services of the valve, from the want of gas passing and thereby keeping it moist, get hardened; and, on the meter being again set to work, the valve was consequently prevented from fitting so closely to its seat as was required for correct measurement — *a thin sheet of gas being allowed to pass without being measured.*" That essential fact Mr. Nash left out, and then goes on and quotes the balance of the sentence.

THE CHAIRMAN. I wish you would read the whole of it.

WITNESS. The whole of it is pretty long, but it closes as you read: "He also found that the material of which the measuring chambers were made got hard, and starting did not distend *so freely as when they left the maker*, and consequently registered quick. He had tested several dry meters which had been at work for some time and found them from 25 to 30 per cent slow and as much fast."

Q. (by the Chairman). Then they measure as often against the consumers as against the Gas Light Co.?

A. Yes; but the important fact is not stated, whether it was a two or three diaphragm dry meter. They use the three diaphragm, and here we use the two.

THE CHAIRMAN. That quotation I took from "The Scientific American" just as it was printed.

Mr. JEWELL. You did not take it from "The American Gas Light Journal"?

THE CHAIRMAN. No, sir.

Mr. JEWELL. Then they garbled it.

WITNESS. At a recent convention in London, which was addressed by Mr. George Glover, he gave ten different reasons for the preference of the dry meter over the wet. I will not read them, because they cover three-quarters of a column. The

first point, and the most important one, is, — "It measures accurately and does not vary in its registration." The other nine reasons are of more or less consequence to gas-makers.

Q. He speaks of it as a meter?

A. Yes, sir.

Q. But when the coal tar comes to act upon it, he don't speak of it?

A. No: but of course it measures against the company, and that is a matter of which the consumer will not complain. They state that it measures against the Company as often as against the consumer.

THE CHAIRMAN. Not when coal tar gets on the valves.

WITNESS. At the conclusion of this convention which Mr. Glover addressed, and of which this paper ("American Gas Light Journal" of Dec. 17, 1866) contains a report, the Chairman, after summing up the evidence on both sides with regard to wet and dry meters, goes on to say — Without condemning the wet meter, which was certainly a most ingenious instrument, he thought that when they looked at the admirable contrivances and beautiful workmanship which were introduced into the dry meters on the table before them, they must incline to the opinion that more permanent accuracy could be obtained by the latter instrument. Now the dry meters which Mr. George Glover makes are what are called the Croll patent two diaphragm dry meters, which we imported from Mr. Glover in 1852, and which we have continued to have made up to the present time.

Q. And after fifteen years' experience, you find them to be accurate?

A. We find them to be the best measure of gas we have been able to obtain.

Q. (by Mr. Hills). Is it not possible, that by the hardening of the leather in a dry meter, it may pass a less quantity of gas than it registers?

A. If the leathers of the meter are exposed to the air, they of course harden; but there is no way in which the air can get in except the meter is opened. The reason why those leathers do not harden is on account of the peculiar oils which are used in their composition. I have never seen the diaphragm of one of those meters harden, which has not been exposed to the air.

Q. After a meter has been in use for some time and is allowed

to remain for a long period of time out of use, the leather becomes hardened, does it not?

A. It would harden undoubtedly.

Q. And then register against the consumer?

A. Precisely.

Q. (by the Chairman). It was stated by these gas men, that they found that meters that were in use, up to say the 1st of May, and then left unused, in consequence of the family being out of town, until the 1st of October, the coal tar had hardened upon the diaphragm of the meter, and it measured falsely. Of course, there was no air there?

A. I don't know what the machinery of Scotch gas works is, but in this city, no tar goes forward to the meter, and of course we do not have that difficulty. I am surprised that any gas engineer should mention such a fact, for it would indicate that the works were not in a proper condition. No coal tar ever went forward in Boston into a meter.

THE CHAIRMAN. They have so much in the burners at the Tombs, that they have to clean them out once in 24 hours.

WITNESS. It is not coal tar; but it is an oil which forms a constituent part of the gas, and ought to be there.

Q. (by Mr. Jewell). With regard to your works, whether there are any pains spared to make them as free from objectionable circumstances as possible?

A. Every pains has been taken to render our works as free from all nuisance as possible. We have done every thing which we have thought of ourselves, or which anybody could suggest to make them agreeable neighbors. I think the result is very clearly perceptible by anybody who visits our works, and contrasts them with the works in any other city. As I said the other night, I think there are no works of their size which are so little perceptible to the senses as ours.

Q. Will you state what is the situation of foreign works relative to the population?

A. Very different in different cities. Liverpool, which stands at the head of English cities in point of engineering, is supplied from four stations; one of them is on the banks of the Mersey, and the other three are away from the river. In Manchester, the works are in the city. In London, gentlemen know they are all

in the city, substantially. I don't mean in what is called the city of London,—that is, in and about Temple Bar,—but I mean in the parishes. In Paris, the works were originally in the city. Paris was supplied by eight different works; and after an investigation of the whole science of gas-making, by a board of scientific men, the Emperor offered a concession of fifty years' lighting upon certain conditions, which were accepted by the companies, and they removed the old works, which were incomplete and imperfect, and gave offence, from the heart of the city, and bought at La Villette, about three miles from Paris, a plot of land, which was then inside the walls, but outside the Boulevards. In 1860, that district was added to Paris with the express condition that the gas works should not be removed outside of the walls, and they are now in the city proper. I know the distance I have given —three miles—to be correct, because the engineer gave me the lengths of the pipe which leads from there to the heart of the city. They have a mile and a half of one size pipe, and a mile and a half of another size. Then they have other works not far from the Jardin des Plantes. In London, one station of the Chartered Co. is about three-eighths of a mile from the Houses of Parliament. Another station of the Chartered Co. is in Brick Lane, and another in Curtain Road, about half or three-quarters of a mile from the Bank. The Western Gas Works, of which Dr. Hayes spoke, are near Kensal Green. The City of London Works are right in the heart of the city—about a quarter of a mile from Fleet Street. The Great Central Works and the Commercial Works are on Bow Common. (The locations of the several London Cos. were pointed out by the witness upon a map of the city.) In Edinburgh, the works are right in the heart of the city.

Q. So that your works are not more objectionable than those of London, Liverpool, or Paris?

A. Less so.

Q. In what respects?

A. None of them have such good drainage as we have; none of them are so favorably situated with regard to the part of the town occupied by residences.

Q. State what, in your judgment, would be the cost of erecting new works such as would be required in Boston, taking into view the prospective increase of consumption in the city.

A. The answer to that question depends upon conditions which are not supplied to me. I don't know where any gas works ca-

pable of supplying three million cubic feet per day, — which would be about the proper size of works undertaking to make gas enough for the city of Boston, — could be put in Boston. There is no place where they could be put. Something has been said about Pine Island. There is hardly room enough there to supply coal yards. Besides, they would have to drain into the South Bay, which would make them a perfect nuisance to the whole of the South End, and cause all those dwellings to be vacated, or reduced in value very much. I don't know where the city could go to put works. That is a very essential element of the calculation. If you ask me the price of bricks and mortar and substantial machinery to build works equal to the works of the Boston Gas Light Co., I should say two and a half millions, irrespective of location; and then, if you have your works five or six miles out, the pipe necessary would cost about as much as our works stand us in at to-day.

Q. You regard your position upon deep water as very vital to the ability to produce cheap gas?

A. I think it was so stated by Mr. Roome, and I agree with him.

Q. Do you include the distributing mains in that estimate?

A. That includes the distributing mains in the city. That is, provided the system of isolated gas-holders is adopted. If the gas-holders are not isolated, of course it would take larger mains for the city.

Q. That you estimate at the present prices of material and labor?

A. Yes, sir. But then, it is impossible to say what city work will cost. One may give estimates for city work, but I think there are gentlemen sitting at this table who know how much they may vary from the actual cost. I have no doubt that offers will be made to build works equal to the Boston Gas Works for a million and a half of dollars; but who knows what they will cost? And there will be no going back; having begun, the city must go through with it. If gentlemen are aware of any thing that the city can build as cheaply as private citizens, I have yet to be informed of it.

Q. (by the Chairman). Can't they build under contract as cheaply as anybody?

A. They haven't done it yet. I don't know what they may do.

Q. Is not the city's money as good as yours?

A. I hope it is.

Q. (by Mr. Jewell). What is there about the character of gas works which makes it less economical for a city to do the work than for a private corporation in this country?

A. Well, in the first place, I think a city can neither build nor manage works as cheaply as a private corporation can. To show what the effect is, in one city of the country, of the gas works being owned by the city, I will read some short extracts from this report on the Philadelphia Gas Works. They are very short, and answer the question in fewer words than I could: —

"To sum up the whole, the failure in the management of the gas works may be largely attributed to the introduction of politics in the appointment of the trustees and their employees. Commencing years back, the evil has grown in force and intensity. Certain it is that corruption once begun goes on increasing, and the last year will always be the worst. Each set of politicians, according to the power they possessed, used the works for their own ends. For a time there was a balance of strength, but in the spring of 1865 the domination of one of them became supreme, and then a wholesale discharge of their political opponents ensued, and their places were supplied with political favorites with but little regard to fitness or capacity."

In consequence of that, they suffered injury.

"Independently of the malignant and mutinous spirit which party changes always are sure to engender, leading to malicious interference with the works, cropping out, as is shown by the testimony, in ruptured holders, stopped-off valves, mutilated burners, and broken pipes, the disastrous effects upon gas retorts, coal, and coke, from inexperienced hands, have been shown by the tables prepared, and the comparison of one year with another."

Q. (by the Chairman). If there had not been those troubles, I suppose they might have supplied gas at about quarter what they do now?

A. That is a question I cannot answer.

Q. (by Mr. Jewell). Is there any thing in the character of gas which makes it necessary that its manufacture should be under a uniform management?

A. Well, if the management is good, certainly, because permanency of management secures permanency of quality, so that the consumers know what they may expect in their transactions with the company; and of course it creates a mutual confidence on the part of both, which is to their benefit.

Q. How many agents has your company had since 1836?

A. Two.

Q. Yourself and Mr. Darracott?

A. Yes, sir.

Q. Have the Board of Directors continued a long time in office? or have they been changed frequently?

A. The Directors have been a long time in office. One gentleman, who died last year, was Director from the beginning. The first Board of Directors remained, most of them, until their death, or removal from the city.

Q. Do you believe that it would be in the power of the city to build works and deliver gas as cheaply as the Boston Gas Light Company now delivers gas to the citizens?

A. I do not.

Q. Or as cheaply as the Boston Gas Light Co. will deliver gas to the city, if their previous policy is followed, in case of any fall in the price of materials?

A. I do not.

Q. Have you any doubt about it?

A. I have no doubt.

Q. (by Mr. Hills). Don't you think the city, with the works you have, could supply gas as cheaply as you supply it?

A. I do not.

Q. (by Mr. Jewell). Will you explain that?

A. Suppose the city should purchase our works to-day, at whatever their valuation may be; they, of course, would be obliged to sell the gas at a price to make themselves whole. The city has no power by which it is able to know, at the beginning of the year, what the gas will cost them during the year, any more than the Boston Gas Light Co. have. But they will know this, that they purchased their works, and they have got to pay interest on the scrip issued to pay for the works. They have got to earn that, at any rate, and of course to earn an amount which will cover their supposed leakage; and they have no more power to

know that beforehand than the Gas Company. They have got to pay the interest, at any rate; if the company don't earn a dividend, they don't pay it.

Q. (by the Chairman). Couldn't the city manage gas works as well as the Cochituate Water Works?

A. No, sir; the conditions are very different. The Cochituate Water Board have not 500 places to give away.

THE CHAIRMAN. The Gas Company don't have 500 places to give away.

WITNESS. They have about five hundred men that they give employment to at the present time.

Mr. JEWELL. The Cochituate Water Board don't manufacture the water.

Q. (by the Chairman). The bad management of the Philadelphia Gas Works did not intimidate Cincinnati from undertaking to supply the citizens from works owned by the citizens?

A. No, sir; they will have to learn wisdom from experience.

Q. (by Mr. Hills). If the city had the present works and employees, they would have to pay only six per cent interest, and would save four per cent if they could make the gas as cheaply, wouldn't they?

A. But that all rests upon the question whether they could or not.

Mr. JEWELL. They would have to pay six per cent, not necessarily on the $1,250,000, but on what they had to pay for the works.

Mr. HYDE. I should think the city ought to have them for $1,250,000; the rest the citizens have paid in.

Mr. GREENOUGH. We won't quarrel about the price, because we don't propose to sell.

Q. (by Mr. Jewell). A great deal has been said about the law of 1861. I should like to call your attention to that, and ask you whether an accurate statement in regard to that has been made here, and if not, what is the correct statement.

A. It will take me a little time to tell, but it is important I should put the matter right. As I said before, the accuracy of our meters very early engaged my attention. I determined to

have the best meters which we could possibly get. But in order to judge of the accuracy of their measurement, it was necessary to have a standard measure of the cubic foot. None such existed; and it was not until the English law was passed that the English Government prepared a measure of the cubic foot. We had had our gas meters tested by a gas-holder made by calculation, which we supposed to be an entirely accurate measure. Whether accurate or not, it was the measure of the Gas Company, and there was no other measure of the sort in New England; and people were obliged to take the Boston Gas Light Co.'s meters as accurate, because the Gas Light Co. said they were accurate. Suppose we took an arithmetician to the test room of the Gas Light Co., and said "There is our gas-holder; take its dimensions, and see whether it measures so and so," very few cared to make the calculation. So, as soon as it was possible to get the measure of the standard cubic foot, I imported one from England; I think it was the first one that came to this country. It was sent out by the English Government. On bringing that here and testing our standard gas-holder by it, we found that we were far more correct than we had any right to expect. I think the difference was two or three one thousandths of a foot. It was some very small fraction of a foot. Having got that here, it at once established the fact, that the test to which we had been subjecting our meters for the previous four or five years was an accurate one. But that was not sufficient; we wanted some standard outside of ourselves, to which our meters could go, and be shown to be accurate; and in the fall of 1860, we petitioned the Legislature for a law. Our petition was referred to the Committee on Manufactures. I appeared before them, and asked for the passage of a law. They said to me, "Mr. Greenough, will you draw a law? We don't know any thing about this matter; it is a subject about which we have no sort of knowledge whatever; will you draw a law?" I said, "No, I will not draw a law. A law which may be perfectly acceptable to the Boston Gas Light Co. might be very hard upon the small companies scattered throughout the State, and I will not draw a law without consulting the small companies." "Will you call a meeting of the gas companies, and consult with them?" "Certainly I will, if you wish it." The Committee expressed the wish, and I called a meeting of the various companies of the State, and stated to them what had been done by the Committee. They appointed a sub-committee, of which I was

Chairman, to draw a law and present it to the Legislative Committee for their consideration. We drew a law, and employed Mr. R. H. Dana, Jr., to bring our case forward properly before the Committee. The law passed the Legislature with one or two trifling amendments, and is the law now in operation in the State. No unfair appliances whatever were used to secure the passage of that law. It has been asserted by the Chairman that "Mr. Greenough undertook to manipulate this Committee, as he did. He took them to Parker's, and feasted them with Parker House suppers, and carried them round the city in various ways, and entertained the Legislature, and got them on his side." Well, that is a pretty broad statement, considering that I never "took them to Parker's," never gave them "Parker House suppers," never "carried them round the city in various ways." I never "entertained the Legislature," and never "got them on my side" by any personal appliances of my own. It is true that four or five of the gas managers who were here in town spending the night invited some of their friends, six or eight in number, to the Parker House, and did give them a supper. If that corrupted the Legislature, I think they were more corruptible than any Legislature that ever sat in Massachusetts before, or, I hope, ever will again.

Q. (by Mr. Curtis). Were you with them?

A. I was not with them.

Q. Did you have any thing to do with it?

A. I had nothing to do with it. Of course, I don't want the gentlemen of the Committee to understand that this law is all right because I say so, or that the motives of the Gas Companies, so far as appeared to me, were honorable to them. I do say, however, that the motives which actuated the gas companies in having that law passed were honorable to themselves and just to the community; and, to show that the impression which was made upon my own mind was also made upon the mind of others, I will read a short note written by Mr. Dana, after the whole thing was over: —

42 Court Street, March 22, 1861.

Dear Sir, — I have taken the liberty to suggest certain amendments, which I think are just to the consumer, and which, I am sure (from the spirit that has governed the Gas Companies in this matter), will be acceptable to them.

I always regard my relations to a Legislative Committee as different from those in which I stand to the Court in the argument of points of law. If I doubt the propriety or justice of a proposed measure, I will not advocate it, — and what I think for the public good, it is my duty not to oppose.

I can truly say that I think the Bill, with these amendments, is not only just to all, but embraces all the justice that I think is at present attainable.

Let me volunteer the remark, that as often as I have appeared before Legislative Committees, I think I never knew an instance in which corporate bodies have made so favorable an impression for reasonableness and fairness, as has been made by the Gas Companies at this session. I have been much gratified at being able to represent a cause conducted in such a spirit.

Yours truly,

RICHARD H. DANA, JR.

W. W. GREENOUGH, ESQ.

THE CHAIRMAN. Perhaps it will be as well, as I was connected with that matter, for me to make a plain and concise statement of the facts, as far as I know them. He is a little wrong in regard to his dates. In 1858, I was a member of the Legislature. In thinking over what I could do for the benefit of the citizens of Boston, the subject of the inspection of gas and gas-meters occurred to me, and I presented it to the consideration of the Legislature. It was referred to the Committee on Manufactures, of which Mr. Wentworth of Lowell was chairman. We went on for a number of weeks, and nothing was said to me by Mr. Wentworth about the draught of a bill; but I think as late as March, and perhaps in April, he came to me and asked me if I could aid him in draughting a bill. I told him I had but little information on that subject, and that he being a lawyer, and practised in drawing bills, I relied upon him to draw a bill that should protect the citizens of the cities and towns where gas was consumed, in regard to its quality and the correctness of the meter measurement. Mr. Wentworth I think went to Mr. Greenough and asked him if he would assist him or would draw a bill of that nature. He declined doing it, and he came to me subsequently and asked me what should be done upon the subject. I told him we had better let the thing go, and take it up the following year. In 1861, I brought the subject up before the Legislature again, and imme-

diately the Boston Gas Light Company appeared before the Committee on Manufactures, of which Mr. Freeman Walker, of the Senate, was Chairman. The second day of the hearing, I think it was, the President of the Roxbury Gas Light Company came into the room where the Committee was in session, and stated to the Chairman that he was deputized as a Committee of one from a Convention of gas men there in session in the city of Boston, representing the Gas Companies of the Commonwealth of Massachusetts, and that he desired to present a bill of their own draught for the consideration of the Committee. Mr. Dexter F. Parker of Worcester was on that Committee, and he immediately turned to the Chairman, and said, "Mr. Chairman, I have no objection to that," and there was no objection made round the table. I simply remarked to the Chairman then, that it appeared very strange that a Convention of gas men of the Commonwealth, held in Boston, should take it upon themselves to draw a law such as should be passed for the protection of the citizens who were the consumers of gas taken from these corporations who supplied it in our various cities. The reply of the Chairman was, that as there had been no legislation on the subject, there were no precedents in this country; and he was willing to take any thing of that nature from them, and the Committee could act upon it as they saw fit. At that time I presented what was then called the Citizens' Bill for the consideration of the Legislature, and used my efforts to secure its passage. The Gas Companies, or the Gas Companies of Boston, saw fit to employ Mr. Richard H. Dana, jr., for he was then the highest representative lawyer in Boston, belonging to the Republican party; and the old Whig party was not in very good odor in Boston, and such a large proportion of the stockholders being of that party, I suppose they thought it better policy to employ Mr. Dana, rather than to take a lawyer from their own body, where they have quite a number.

Mr. GREENOUGH. I beg your pardon. You said you would state facts; now you are stating merely surmises.

THE CHAIRMAN. They are surmises based on the facts. I went before this Committee, and Mr. Dana appeared as counsel for the Gas Company. I was single-handed and alone in the whole matter. The bill submitted by the Gas Company was not, in line and letter, passed by the Legislature, but in substance it was. There was one section against which I entered my protest

as "infamous" (that was the term I used); and that was the section which gave the right to a gas company to go into a house at any time and take away the meter, if there was any disagreement between the company and the person they were supplying with gas. That section was altered in such a way as to fix the hours in which they should separate the meter from the pipes in your house or mine, or that of any other person.

With reference to the matter of the entertainments that were given by the Boston Gas Light Company and the gentlemen associated with that Company as a convention in the city of Boston, I had the statement direct from Mr. Stebbins, of Boston, who I think was a representative that year, that he was going down West Street one evening, and saw a large body of the Representatives on their march down that street, with Mr. Greenough at the head, and that, being acquainted with a number of them, he asked the first one he overtook where they were going. "Down West Street to the Gas Works; and then," said he, "we are going to Parker's for a supper," or dinner, it makes no odds which. There is the statement in regard to this supper or dinner that was given to members of the Legislature. That winter, Mr. Giles was sent to the Legislature, and he was exceedingly active in his movements about the House in regard to the action that the House might take in the enactment of that law, and there were other members in that House who were particularly strong in their advocacy of the passage of the bill that was presented to the Committee; and I was not able to get my "Citizens' Bill" into the House, but I did get it into the Senate, where it was presented by a Senator from Plymouth Company, who held in his hand, as he stated, and I believe it was true, petitions representing ninety-five millions of capital, and not a name upon the petition that was not that of an active business man in the city of Boston.

These are the facts in regard to the progress of this matter. To my knowledge, no person ever presented the subject of the inspection of gas and gas meters to the consideration of the Legislature, but my individual self.

Mr. GREENOUGH. Will you allow me to remark, that the statement that Mr. Wentworth consulted with me in regard to this bill is an entire mistake? I never saw it until it was presented to the House, when it was brought to my notice by a gentleman con-

nected with a neighboring gas company, who asked me if I had seen the bill.

THE CHAIRMAN. I omitted to mention that Mr. Wentworth did draw a bill, and came to me with it in print. I think it embraced six or eight lines. I said, "This amounts to nothing." "Then," said he, "we must let it go over." That is the only bill I ever saw until the two bills were presented in 1861, — the one coming from these gas men, the other from myself. In April, 1861, the present bill passed the Legislature. The petition went in at the very session when this bill was passed, that is now a statute of the Commonwealth. That law is mainly, line and letter, the very bill that was drawn by these gas companies. I pointed out many objections to that bill, and entered my protest against its passage, because it did not allow any person to inspect gas but the State Inspector, though he was authorized, if occasion required, to appoint a deputy to inspect the meters. The bill I drew is in print, and it can be compared at any time by the Committee with the present bill. A fairer bill was never presented to the consideration of a legislative body than that bill of mine was, both towards the citizens and the Gas Companies. It was a just and fair bill.

Mr. Greenough stated to the Committee that the Boston gas was a good average seventeen candle gas, and they put into the bill, that the standard should be fifteen candles. Mr. Greenough strenuously opposed that, and got it reduced to twelve. When he objected to the standard of fifteen candles, the Committee replied, — "Why, you represented your gas as being an average of 17 candles, and why should you object to the standard being 15?"

Mr. GREENOUGH. The answer to that is, that, as far as Boston was concerned, it was of no consequence; but as the law was applicable to the whole State, and there were companies that could not afford to make gas as high as that, it was unjust to establish a standard that they could not come up to.

My attention has been called to another point in the statement of the Chairman last spring. He says, — "That law was log-rolled through the Legislature by the Boston Gas Company. They went into convention with the other companies of the State, and passed that bill, which was drawn by his [Mr. Greenough's] father-in-law." That refers to Mr. Curtis. He never saw the bill, so far as I know, until it had passed the House. The bill, I think, was substantially written by me.

Q. (by Mr. Curtis). By Dr. Hayes's testimony, it appears that when he was employed by the company, the illuminating power of your gas, by photometric tests, was from 22 to 23 candles. You have stated that the quality of your gas now is the same as then, and you state the illuminating power as 19 candles. Will you state how you reconcile these two statements?

A. Well, we use the same material that we did then, and we use it in substantially the same proportions. But the photometer which we used at that time was different from the one we use now; and to show what that was, I will read a short note from Dr. Storer, which he has written to me to-day: —

132 Tremont Street, Dec. 19, 1866.

W. W. Greenough, Esq.

Dear Sir, — In reply to your inquiries concerning the value of the gas furnished by the Boston Gas Light Company to consumers during the period that I have held the position of consulting chemist to the company, I would reply that I have inspected the gas daily, at the office in West Street, since July, 1857, — making, on the average, some 23 or 25 observations for every month since that time.

The gas has improved decidedly in quality since 1857. At the time when I first became connected with the company, the gas was habitually tested, not with the Bunsen photometer, such as is employed by other Gas Companies in Europe and this country, but by another instrument, — called by us the Ritchie-Hayes photometer. The results obtained by the instrument last named are not directly comparable with those afforded by the Bunsen photometer; — they are always more favorable for the gas than the results obtained with Bunsen's instrument.

At my request, the Ritchie-Hayes instrument was replaced in the winter of 1857-'58 by a Bunsen photometer, imported from London. As tested by this Bunsen photometer, our gas measured 16 or 18 candles in 1857, — against the twenty-odd candles which were then indicated by the Ritchie-Hayes instrument, — and it has continued to measure as high as 16 or 18 candles from that time until the present.

During the year 1866, the average candle power has been about 19. The gas has been better purified during the last two or three years than ever before.

Very respectfully,

Your obedient servant,

FRANK H. STORER.

Q. Dr. Hayes made another statement, to the effect that it would be expedient, and perfectly practicable, to put pipes underneath the sidewalks in the streets. How is that?

A. Well, of course, every thing is practicable; but all the pipes that we had under the sidewalks we were obliged to take out, one after the other, until now we have no pipes, I think, under any sidewalk. In Boston, the custom has prevailed for many years of putting arches under the sidewalks; and then, of course, large mains could not be put in there, because, in case of breakage, the neighborhood of the houses would render them dangerous, and it would be very inconvenient to have them there. Besides, if you lay mains under the sidewalks, you have got to have two, one under each side of the street, so that it would add greatly to the expense of distribution. Of course, every thing is practicable, if you will pay the money for it, but this would be very inconvenient and costly.

Q. There is a provision in the present law, that the Inspector shall not recommend meters. In your opinion, is that a proper provision, and why so?

A. A most just provision, because the first condition with regard to an Inspector should be, that he is eminently impartial; that he shall not take fees from this man or the other for commending this little invention or that; but that he should be paid a sufficient sum to make his services entirely impartial, so that everybody could appeal to him as a truthful person. He should not be subjected to the suspicion of taking money for certificates.

Q. Have you or any other Gas Co., as far as you know, any objection to a customer furnishing his own meter, if he chooses, if it is stamped?

A. No, sir; certainly not.

Q. And he may keep that meter at any temperature he pleases, or that he thinks is most beneficial to himself?

A. Precisely.

Q. What information is there that a City Inspector could impart to the public that they cannot get from the State Inspector?

A. I don't know of any.

Q. Have you any objection to the city now having an Inspector of their own, to be paid by themselves, to make an examination and inspection of your gas as many times a day as they choose?

A. Not at all.

Q. And publishing the results in the papers?

A. Not the slightest.

Q. There has been a good deal said about some of the companies in London making exclusively Cannel gas, and other companies making Newcastle gas, — is there any line of demarcation between these two kinds of gas?

A. I have nothing to add to the statement of Prof. Rogers. He says, "We talk about the distinction between Cannel gas and common gas; there is no precise line of demarcation to be drawn between them. There is an immense variety in common coal gas, and a very great variety in Cannel gas. There is a gradation of one into the other."

Q. You have heard what has been said about an instrument or device called a "Governor," — are you acquainted with that?

A. I am.

Q. Have you one at your works?

A. We have.

Q. Do you know of any mechanical device which can equably and successfully regulate the pressure from gas-holders concentrated about works at a distance of three or four miles from the point of distribution?

A. There is no such instrument that I have ever seen, and I don't think one could be made. I don't think it would be practicable to do it, so as to insure that every person should burn his gas at precisely the same pressure every hour of the night.

Q. I should like to ask you what is the standing, among gas people and gas manufacturers, of Col. Roome, and what is the value of his statements upon any point?

A. I know no engineer in the country his superior or equal. No man has had so much experience as Col. Roome.

Q. In respect to the construction of gas machinery, what is your opinion of the value of Mr. Starr's opinion?

A. He is well known among gas people as being the largest manufacturer of gas machinery in the United States. He has built many entire works by contract, and is a perfectly competent and trustworthy person.

Q. I should like to know whether you have previously known Mr. Salisbury, who has testified here as an expert in gas matters?

A. I never saw him until I saw him here, and never heard o him before.

Cross-examined by Mr. Stackpole.

Q. Do you decline, or do you not, to state to the Committee the cost of your gas here in Boston?

A. I do decline, certainly.

Q. On what grounds do you decline?

A. Because I have no right to state it.

Q. If you were losing money on your gas, should you also decline to state the cost?

A. I think not.

Q. And therefore it is because you are making money on your gas that you decline?

A. I have said that we were making money latterly, but did not make money in 1864 and '65.

Q. And it is for that reason you decline to state to the Committee the amount you make?

A. It is not customary for the seller of merchandise to tell the man who buys it what it cost him.

Q. Being here as a witness, to give the Committee all the light you can as a citizen of Boston, you decline to state the cost of your gas?

A. Being here as witness before the Committee, under cross-examination, I decline to state what the gas costs.

Q. Or on direct examination?

A. Or on direct examination.

Q. Col. Roome had no objection to stating what his gas cost?

A. Precisely.

Q. Because he was losing money?

A. He was losing money.

Q. And what is your motive in withholding from the Committee this knowledge?

A. I don't know that I can say any more on that point than I have. I decline to state what the cost of the Company's gas is. I decline stating any thing further about it.

Mr. HYDE. This is hardly what the Committee expected. When the Committee commenced its session, I made this remark, that I supposed the Committee had no power to force the attendance of witnesses, nor to compel answers; I have since found that I was mistaken, and that the Committee have power to compel the attendance of witnesses. How far that power confers the

right to compel answers in accordance with the decision of the courts, that the granting of a constitutional right carries with it all the powers necessary to make that right available, I will not consider here; but I stated distinctly, at the outset, that I wished to have an understanding upon the matter as to the questions that might be put, and the answering of them; and I think it was understood,—at least the Committee were given to understand,—that if the witnesses we produced were put upon the stand, and allowed to be cross-examined by the opposite side, we should have the same privilege in regard to the witnesses put upon the stand by the other side. Of course, in a case like this, the party on the other side is the Gas Company. Their principal witness is the agent. At the request of the Company, that agent has been allowed to be withheld until the close of the hearing. The Gas Company have been allowed to put in every thing they desired; and having put in all their other evidence, they now offer their agent as their last witness; and when he is asked a pertinent question, which affects the city, the answer is declined. Now the City of Boston does not stand in this case in the same position as that of a purchaser in regard to merchandise. The City of Boston grants to the Gas Company a franchise — an exclusive franchise — a monopoly. That franchise or monopoly granted by the city — I mean, of course, through the charter that comes from the Legislature — is of very great value. I suppose the Gas Company would not like to have it taken away for fifty or a hundred thousand dollars a year. Now, the city being engaged in investigating this matter, the Gas Company admitting the city's right to investigate, by appearing here by its agent and by counsel, and a pertinent question having been put, which is relevant to the hearing, having reference to the very question under investigation whether the citizens are being fairly treated by this Company, which is receiving a franchise from the city worth fifty or a hundred thousand dollars a year for nothing, or for what little may be saved by the reduction on the street lamps, as compared with other customers, — this pertinent question, I say, having been put, the agent of the Gas Company declines to answer, putting it upon the ground of right, while he admits that, if they were losing money, he would have the right to answer. They are, therefore, making money, and as that money is made out of the citizens of Boston, as the Gas Company have consented to appear here, as the Gas Company have put in

their evidence and cross-examined the witnesses for the city, it certainly is not courteous to the Committee to refuse to answer the question. It certainly is not usual in a hearing, after a man has told all his own side, to refuse to tell the other, unless he puts it upon the ground that it criminates himself. As I have said, fearing that something of this kind might occur, I forestalled it, by stating distinctly, at the opening of the hearing, that I wished to understand whether all proper questions would be answered. Now, although neither Mr. Greenough nor his counsel assured us that every question we might ask would be answered, they did assure us, by acceding to that, or making no objection, and going on with the examination, that every reasonable question should be answered. I will admit, what Mr. Greenough states here, that the Gas Company can make gas cheaper than the City of Boston can; I think any Company can. Now, if the Gas Company is only charging a fair profit, and furnishing a proper quality of gas, — and upon the quality of the gas we have had evidence, — then the Gas Company have made out their case; if not, then the city have something to say about it. I think that is the way this matter stands. I do not, of course, wish to press Mr. Greenough unreasonably, nor to do any thing which should unreasonably affect his relations to the Company. But the Company have appeared here, and, by appearing, have conceded the right of the Committee to ask all reasonable questions. Of course, it was known from the first, that one of the most important questions would be, "What does the gas cost the Company?" and we have left the question until now, because they said Mr. Greenough should take the stand, and should submit to cross-examination in a reasonable manner.

Mr. Stackpole. I can hardly add any thing, Mr. Chairman, to what the gentleman on your right [Mr. Hyde] has said, because he has stated the points so clearly. I was about asking the Committee, when he spoke, whether they desired me to go on with this cross-examination, the witness declining, and persistently declining, to answer questions involving those facts which are the most pertinent for the Committee to know. If he declines to answer those questions, I do not see that it can be of any avail to go on with this examination, and I desire the judgment of the Committee upon that point.

Mr. JEWELL. I don't think I ought to allow these statements made by the member of the Committee, Mr. Hyde, or the counsel for the city, to pass without remark. In the first place, I recollect perfectly well the statements to which Mr. Hyde has alluded in reference to this hearing; they were made, I believe, in some conversation which took place between him and myself. He said —"We are going on with this hearing; we are going to call witnesses. We know perfectly well that we cannot compel attendance nor answers, but we shall go on with the examination, and you will get such people to come here as you can;" but nothing took place between us (if it is to that conversation that the gentleman refers) which should bind us to allow Mr. Greenough, if he had the right, to make statements which he thinks he ought not to make. I differ, Mr. Chairman, from the gentleman, in the remark that it would be proper for him to make the statement, even if we were making gas at a loss. The knowledge which he has of the details of making gas is his property, as Trustee of his Company.

Mr. STACKPOLE. I have not asked him for a single fact of that kind. I have simply asked him for the cost of his gas.

Mr. JEWELL. That is among the economies of his company, and he has no right to communicate it, in my judgment. I undertake to say that he would be very much in the wrong if he should, at this hearing or any hearing, give the details of the economies of his corporation. I recollect perfectly well when an attempt was made, before a Committee of the City Government, to fish out the economies of the Gas Light Company, by persons who wanted to open the streets of Boston, for the purpose of knowing whether their scheme was a money-making one or not. Why, they summoned Mr. Giles and Mr. Greenough, by a Justice's subpœna, before a Committee of the City Government, to try to compel them to state the details of their manufacture and the profits on their gas; and they stated, in a printed circular addressed to the City Government, that they wanted to bring them here for that purpose; and although they didn't say that, the truth was, they wanted to know whether they had a good operation in hand. I say that Mr. Greenough would be unjust to his stockholders and officers, and unjust to himself, if he came here and made known the details of his business; and when you ask him the naked question, "What

did your gas cost at a certain time?" you lay the foundation to ask as many more questions about the details as you please.

Mr. STACKPOLE. Better wait till we ask them.

Mr. JEWELL. Better stop on the threshold. We have shown by all the testimony, — Dr. Hayes himself says, — that gas cannot be made and sold at a profit, except at $2.50 a thousand; and we have shown you that the average net that our gas produces is only about $2.51. Mr. Roome, a most excellent man and most skilful officer, has been here, and he tells you that the Boston Gas Light Company cannot make its dividends and sell gas at a less price than now; and if he don't know, who does?

Mr. HYDE. That is just the point. The Gas Company have appeared and given evidence as to what gas costs, and the counsel has argued that they have proved that the price charged in Boston is not unreasonable. This case is different from the one where he says the Gas Company were compelled to come here. He has come here voluntarily, and has been permitted to say whatever he pleased to the advantage of the Company, and argues that they have proved a point by inference. We ask for a specific answer to the question which they say is answered by drawing an inference. The counsel asks us to infer that their gas costs them about $2.50 per thousand; and yet the agent on the stand declines to give us the information which he insists we shall draw as an inference. There is the inconsistency.

Mr. JEWELL. My opinion is not changed by this discussion. Suppose, Mr. Chairman, that Mr. William Gray was brought here by us, or came here himself, and was asked a general question on the subject of cotton manufacture, — do you believe he would feel himself at liberty to go into the details of the economies of his management? Do you suppose Mr. Little, the manager of the Pacific Mills, would come here and allow himself to give the details of the management of that company; or that Mr. John Gardner, of the Salisbury Company, would undertake to do it? Not at all. That is information which belongs to those officers, and it is held by them in trust for the use of their corporations; and I say they would be derelict to their duty if they disclosed those facts, which might be used to their injury, not in this hear-

ing, but elsewhere. We have said already, — Mr. Greenough has told you, — that at $2.20 a thousand, gas is sold at a loss; and we have shown that the average we receive is only $2.51 a thousand. It seems to me that we have given all the data we ought to be expected to give.

Mr. STACKPOLE. The Committee will at once see that I can present no case unless I am able to test the witness's statements by cross-examination. The case is too plain for argument.

Q. (by Mr. Hyde). As I understand Mr. Jewell, your gas is sold to the citizens at $3.25, to the city at $2.50, and the average is $2.84.

Mr. GREENOUGH. No, not of those two sums. We manufacture a certain amount which costs us so much per thousand cubic feet. For that, we get paid by the City, $2.50 a thousand; we get paid by meter, $3.25; and for the balance, $9\frac{8}{10}$, we don't get paid at all.

Q. I understood you to say, that the average price of your gas is $2.84?

A. I said the average receipt for the gas consumed was $2.84.

Q. That includes the city and all?

A. Yes, sir; but does not include losses by bad debts.

Q. Is not that charged to the cost?

A. No, sir. This is the amount of gas sold. From this sum is to be deducted the sum lost by bad debts, and the discounts made to large consumers. Deduct the amount paid for taxes, 33 cents and a fraction from $2.84, and you get the sum Mr. Jewell has given as our net receipts.

Q. (by the Chairman). Do you include the sum received for coke and coal tar in making up that amount?

A. No; the coke and coal tar are not included.

Q. How many thousand tons do you sell in a year?

A. The sales of coke vary very much from year to year. I think, for the year 1865, the total sales of coke and coal tar amounted to about $70.000.

Q. What did you get a ton for coke?

A. I don't remember, but I think $6.00 or $7.00 for that which we sold.

Q. In 1864, didn't you charge as high as $8.00?

A. I don't recollect what we charged then. At one time, we sold it as high as $8.50. I think that was in the fall of 1864.

Q. You did sell as high as $9.00 at one time, didn't you?

A. I think, for two or three weeks we did, — $9.00 delivered.

Q. (by Mr. Hyde). You say that you get for your gas $2.51 per thousand, and make a profit at that?

A. At $2.51, with the addition of the coke and coal tar, we get a profit.

Q. How much was the stock of the Gas Company when first chartered?

A. In 1828, I think it was $75,000. I am not sure about that.

Q. How much is the chartered stock now?

A. We have the right to issue two millions. The stock paid in is $1,250,000.

Q. What is the amount laid out for real estate and buildings?

A. Our real estate stands upon our books, including the land, I think, and the office which we occupy in West Street, at about $700,000. I don't remember exactly, but I have given all those figures to the assessors. As I didn't know that I should be asked that question, I did not bring them with me; they are in the City Hall.

Q. That includes all your holders?

A. No, sir; they are machinery.

Q. Then what has the machinery of the Company cost?

A. That I am unable to say.

Q. What have your holders cost, with the land they stand on?

A. That I cannot tell you, because the land stands by itself.

Q. Have you given the land in that estimate?

A. The land is in that estimate.

Q. Now the buildings?

A. It would be mere guess work — I cannot tell you.

Q. How many holders have you?

A. There are five.

Q. What did the Camden Street holder cost?

A. About $125,000.

Q. The West?

A. It is all guess work, it is so long since, and I have not the figures in my mind, but perhaps $60,000.

Q. The Federal Street?

A. I should say about $75,000 — built in 1853. The North, about $90,000. Hull Street, about $30,000. This last is a small one.

Q. Have you included in the $700,000 the works on your land at the wharf?

A. No.

Q. What did they cost?

A. I cannot tell you. I have no data to make an estimate upon.

Q. I suppose they have been taxed?

A. They have been taxed.

Q. Haven't you given in to the assessors what they cost?

A. No, sir; the assessors made up their statement in the best way they could.

Q. You have stated something about what it would cost the city to go ahead and build new works, and you must have been able to state that from your knowledge of what yours have cost, or else it cannot have any special weight?

A. There is one item upon the valuation of street mains and meters, which was taken from a statement which we furnished to the City Gov't. They were not taken at the valuation which they stood at on our books, but taken, as I understand, at what the assessors estimated it would cost to put down the same works. There was an item of $525,000.

Q. Should you say that for your buildings and machinery down there, aside from the gas-holder, $300,000 was too high an estimate?

A. No.

Q. Well, $500,000?

A. They were valued for a series of years by the city at $600,000; and the estimate which they made up was the best estimate which they could, after consultation upon the facts, arrive at. I assisted them with pleasure, to every thing that I knew.

Q. $600,000 is a fair sum, is it?

A. I presume those figures would be about right. The amount of land is to come out. The custom of the assessors is, I think, to take off so much a foot for our land.

Q. Should you think $600,000 would be fair, taking out the land?

A. I should think $600,000 would be rather large.

Q. $500,000?

A. I cannot answer precisely.

Q. Now, what is the valuation of the wharf property?

A. $260,000. I don't remember how that agrees with the cost.

Q. Now as to the amount of capital that it takes in coal?

A. The Company is obliged to buy about 50,000 tons of coal a year. Of course, the capital required for that depends upon the price of that coal. Our coal cost, in the year which there has been so much discussion about (1865), $11.47 a ton, on the average.

Q. Then your capital stock for coal was half a million, in round numbers?

A. Yes, sir.

Q. (By the Chairman). What has it cost you this year?

A. That I don't know.

Q. Does it cost this year over $8.50?

A. Oh, yes, sir.

Q. (by Mr. Hyde). Now your street mains?

A. You have got them there [on schedule of property of Gas Company]: street mains and meters, $525,000.

Q. That is not an overestimate?

A. Oh, no.

Q. Would they cost the city a million to put them in to-day?

A. I should think they would.

Q. Have they cost the company that?

A. No, they have not cost the company that. They were put in at lower prices of iron, labor, &c.

Q. I find here, "Houses," &c. What are they?

A. That is the real estate we purchased this year; those small tenements, of which they took the amount from last year's estimates — $72,000, I believe.

Q. Those were included by you in giving the real estate of the company?

A. No, sir. They were not upon the original statement. There was a second tax bill. You want to add $72,000 to the cost of the real estate.

Q. Does the company own any stocks as invested property?

A. Not at all. It has no investment in any thing else except its own property.

Q. I understand the company has received from the stockholders $1,250,000. Has that all been paid in cash?

A. Yes, sir.

Q. The rest of the property of the company has been earned by the company?

A. Has been earned by the company, or is owing to the rise in real estate.

Q. How great is the debt of the company?

A. About $200,000.

Q. When did your connection with the company commence?

A. In 1852.

Q. From 1855 to 1865, were not the profits of the Gas Company, after paying for the cost of the gas, — I mean the cost of the coal, and the cost of extracting the gas, — paying for their repairs and labor, and the usual wear and tear, but not paying for any increase of working mains or any increase of their property — were not the profits of the Gas Company, after paying their current running expenses, equal to 25 per cent upon their capital stock?

A. I think not. Oh, no.

Q. When you spoke, a while ago, of obtaining a *temporary* loan to build a new gasometer, why was the word "temporary" used?

A. Simply in relation to its being put into stock at some future day.

Q. That is, it is to be paid out of the surplus earnings, when made?

A. No.

Q. The others have been paid for so, have they not?

A. No, the stockholders have been called upon to pay for them by calling in new stock.

Q. If I understand it, the stock of the company paid in is $1,250,000?

A. Yes.

Q. The debt of the company to-day is about $200,000?

A. Yes.

Q. And the property of the company is about three millions?

A. Well, I shouldn't want to say that.

Q. Should you want to say it was less than three millions?

A. I shouldn't want to make any statement about it, to be considered minutely accurate.

Q. In round numbers?

A. I shouldn't want to say it was worth three millions of dollars.

Q. The cost, I mean?

A. No, I should hardly think it could have cost as much as that.

Q. How much has been the rise of real estate to the company?

A. That I never have calculated.

Q. How much should you think?

A. The rise has been so very unequal, that I don't think I ought to make an estimate upon it. For instance, that first land which we bought, at three-eighths of a dollar, is worth at least $2.50 a foot; while other land, that we gave $1.50 for may be worth the same price; and for other land, we gave as much as it is now worth. Taking the whole of the real estate that we own, I couldn't make a guess now, and I don't want to guess in answering such a question as that.

Q. Should you be willing to say that the Gas Company have in all these ten years, been making 25 per cent profit?

A. I have no recollection any year of making 25 per cent.

Q. Should you be willing to state that they didn't make 20 per cent?

A. It is quite possible we may have made 20 per cent the year before we reduced our price, but I have no definite recollection of the amount of profits any year.

Q. I understand that there was one year in which you were obliged to pay your dividends out of your surplus earnings?

A. Yes.

Q. Did you absorb all your surplus earnings?

A. We did not.

Q. Do you still hold surplus earnings?

A. Yes.

Q. To what amount?

A. We have no surplus earnings now in cash. Our surplus is about $200,000.

Q. Then the surplus and debt just about offset each other?

A. Deducting the debt, the surplus is more than that.

Q. (by the Chairman). Should you be willing to show the Committee your net earnings from your books for ten consecutive years?

A. With the consent of my Directors, I should.

Q. (by Mr. Hyde). Then if I understand you the surplus of the company above its debt is to day $200,000 in round numbers?

A. Yes; invested in plant.

Q. From what then, did you pay those dividends?

A. At that time, we had a surplus of money.

Q. The question I asked was this — If you exhausted that surplus in paying those dividends.

A. I said, no. At that time, we had, I think, money enough from our surplus to pay the dividends. Of course, when money is in hand, it may be either considered as surplus, or as cash to be used for the purposes of the corporation.

Q. But you stated that you did not pay your dividends out of your earnings, but out of your surplus. Now I ask, in what form was that surplus?

A. It was in money.

Q. Did you exhaust the money in paying those dividends?

A. I should think not, at that time.

Q. What has been done with that balance since?

A. Of course, the whole surplus of profits as it stood upon the books at that time, has been invested in property; and if we have on hand at any time any amount of money, that may be considered our surplus, either as money or as property, may it not? We paid those dividends from money we had on hand. Of course, we had a surplus after paying them, but then that surplus was either in money or property, you may consider it either you please.

Q. What I wanted to get at was, not what we might consider, but a matter of fact. You said you paid dividends from your surplus, and did not exhaust the surplus?

A. No, sir: we did not.

Q. I am talking about money simply.

A. If you ask me whether, at the various times when we paid our dividends, we had any more money on hand than we paid for those dividends, I cannot tell you.

Q. Then how can you tell whether you are paying your dividends out of your surplus or earnings, if you cannot tell whether you exhausted your surplus by paying the dividends?

A. Precisely in the same way I have said; you may consider your money on hand part of your property or surplus.

Q. You have used the expression, that you did not earn money enough to pay dividends, but paid them out of the surplus. That is you had a cash surplus out of which you paid the dividends. Now, I ask if that dividend exhausted that cash surplus.

A. That I cannot answer.

Q. Supposing you should not earn a dividend this year, what should you do?

A. I can't say what we should do.

Q. Have you enough money to pay a ten per cent dividend?

A. I shouldn't think we had, I can't say whether we should or should not pay a dividend until the time comes.

Q. (by the Chairman). Would there be any cash surplus to fall back upon?

A. Of course, our surplus, whatever it is, is a permanent investment; the property is there. I see what your point is; you want to get at precisely this: If we paid $25,000 in dividends, did we have $26,000 on hand when we did it; and if so, what became of the other thousand dollars. That I have no recollection about.

Q. (by Mr. Hyde). You know the dividend was paid in one way or the other. If you paid it out of the surplus, — I don't mean the surplus invested in machinery, or real estate, or coal, or any thing which constitutes the working of the Company but what we understand as surplus capital, that is, a reserved fund to meet losses, or pay unexpected bills, or pay dividends, if dividends are not earned, — what is usually understood in corporations and among capitalists as surplus, I ask whether you exhausted your surplus in paying that dividend?

A. I think I answered that before — that we did not exhaust our surplus. I think we are differing in terms rather than in reality. I leave it where I did. I have nothing to add to that. I have answered the question. You asked me whether I paid that money from our surplus; I answered that I did. You asked me whether I paid it in cash; I answered that I did. Then you asked me if I had any surplus in cash on hand after that was paid, and I say to you, I can't tell whether I did or not.*

Q. Don't you know, as a matter of fact, whether or not upon the books of the Gas Company there stands to-day any surplus of cash, or money invested outside in stocks, say in Western Railroad stock, or city or United States bonds?

A. I answered, that every thing we have is invested in the prop-

* *Note.* This is merely matter of account. The amount of dividend paid over and above earnings diminished, by precisely the amount thus paid, the sum standing to the credit of profit and loss.

erty of the company. We own no vessels, no mines, no stocks, nothing but the property of the Gas Light Company in Boston.

Q. Then to get at the point, I understand that the surplus that has accrued to the company, after paying their running expenses, and their dividend of ten per cent, whether earned that year or not, has been turned over to the company, and invested in the increase of their works?

A. There is a charge to depreciation account also.

Q. Over and above the depreciation account?

A. Yes: every thing over and above that has gone into this plant.

Q. Forms part of this $200,000 of which you spoke?

A. Yes.

Q. Then, if I understand it, the whole thing resolves itself into this; that the Boston Gas Light Company, commencing with $75,000 as cash paid in has increased its capital, as cash paid in, to the amount of $1,250,000; that on this stock which has from time to time represented the company, a dividend has been paid of 10 per cent; that in addition to that 10 per cent, there has been acquired a surplus which has been invested in works; and that surplus, so invested in works, over and above the depreciation account, is equal to two millions of dollars.

WITNESS. Well that is not the way I put it.

Mr. HYDE. That is the way the figures put it. Therefore, the citizens of Boston have paid for their gas, as a matter of fact, the cost of manufacture and distribution, wear and tear, the depreciation account, the expenses of the offices, all the running and current expenses of the company, and, in addition to that, have paid a sum equal to two millions of dollars. In other words, the citizens of Boston have already paid enough to the Gas Company, over and above its 10 per cent dividends, to erect their own gas works.

Mr. CURTIS. I don't see it, and I don't understand what you are testifying.

Mr. STACKPOLE. The figures show it pretty plainly, and they don't lie.

Mr. HYDE. And these are the statements, given with reluctance, of the agent of the company, and not furnished from the books; and if they are wrong in any respect, we should be most happy to have a correct statement furnished from their books, and wewill take it, if it reduces this amount to any extent.

WITNESS. We will take that point into consideration.

Mr. CURTIS. I suppose, if that were true, that is not the question we are considering. The question is whether the city could go to work and make gas cheaper than we can.

Mr. STACKPOLE. The question is, whether, in ten years, the citizens of Boston are to pay for another set of gas works.

Mr. HYDE. The question is, whether we are not paying all the expenses of the company, and for all the increases of the works.

Mr. CURTIS. Not now.

Mr. HYDE. Who is to pay for the increase of the works?

Mr. CURTIS. Whoever will be called upon to pay, at the end of five years, the $500,000 or take stock.

Mr. HYDE. As a matter of fact, every dollar which was put in at first is represented by three dollars as value. Now, you have increased from one to three, and you simply divide your profits.

Mr. CURTIS. The value of the stock in the market shows precisely its worth.

Mr. HYDE. No, it don't, for the citizens don't know what the property is worth.

Mr. CURTIS. The city taxes the property for more than it is worth in the market, and the city taxes it at exactly $800. The stock sells for $750.

Q. (By Mr. Stackpole). You stated I believe, that you made no stock dividends?

A. I did.

Q. In 1864 you increased your capital stock?

A. We did.

Q. How much?

A. $250,000.

Q. And the old stockholders were allowed to take one new share to how many old?

A. One new to four old.

Q. At par?

A. Yes, sir.

Q. The stock was then selling at $800 or $900?

A. Formerly about $800. I forget now what it was at that time.

Q. And rights of the old stockholders to take that stock sold at something like $60 or $70?

A. I think they did.

Q. They received that year 10 per cent?

A. Yes, sir.

Q. If they saw fit, then they could go into the market and sell their rights for $60 or $70, so that it really amounted to a dividend of 18 per cent?

A. They got of course, their ten per cent, and those who sold their rights of course got what profit they made on them.

Q. (by Mr. Hyde). Here is a statement to this effect: that you lost money by selling gas to the city at the prices charged. Now, I understand that the price which the city pays for its gas is $2.50. Does that include the Government tax?

A. Yes, sir; out of that we pay the Government tax.

Q. Then, what the company receives for the gas furnished to the city is $2.25?

A. At present; it was $2.20 last year.

Q. Now from that $2.25 there is to be deducted 33⅓ cents?

A. No, sir; the 33⅓ cents were the aggregate of all our taxes, State, City, and United States. It was spread over the aggregate amount of gas. Of course, that tax was not paid upon the gas unaccounted for, it was paid on the gas burned at the works, sold by meter, and burned in the city lamps.

Q. Then I understand that at $2.84 the Company made a profit, and at $2.20 they made a loss.

A. Yes, sir.

Q. Do I understand the Company to say that at $2.50 they made a loss?

A. I have said distinctly that at $2.51 there is no loss.

Mr. JEWELL. We say, we didn't make a dividend in 1865; we don't say we made a loss.

WITNESS. With the sales of coke and coal tar, we made a profit.

Q. Then all between $2.84 and $2.50 is profit?

A. Not exactly.

Q. (By the Chairman). You have stated that you made a profit, including the coke and coal tar; didn't you make a profit excluding them?

A. No, sir, not in 1865.

Q. Didn't you make a profit excluding the coke and coal tar from 1860 to 1864?

A. That I can't tell you. I can't recollect about that.

Q. (by Mr. Stackpole). You read us some extracts from this paper (Report of Committee on the Philadelphia Gas Works). Will you please read that paragraph?

A. I will see what it is. Perhaps it is more appropriate for you to read than me. [Reading.] "The loss admitted by the cashier in his annual report on the operations of 1865 being $158,783.61, the only year since the existence of the works when they proved to be a losing concern, although they were getting enormous profits; and this, too, while every other establishment of a like kind was making money and paying dividends." Very good. I make no objection to that.

Q. (By Mr. Hyde). Do I understand you still to decline to answer the question in regard to the cost of your gas?

A. I do.

Mr. Hyde. Then the Committee stand in just this position: They are here in behalf of the city, having granted the Gas Company a hearing at their request for the purpose of making a report to the citizens whether or not they have been fairly dealt with by the Gas Company in the matter of the supply of the city with gas. I don't know that any of the Committee have any desire for private information, in any manner or form, — certainly I have not. We have no desire to pry into the affairs of the Company, but simply to ascertain what the citizens are paying for the gas, and the quality furnished. These are the two questions for our consideration. Upon the quality of the gas, evidence has gone in to the fullest extent; the Company have been allowed to show every thing in their favor. Upon the cost of the gas, the Company have been allowed to furnish every thing, and their counsel have called upon the Committee to draw an inference as to what it costs; and then, when the direct question comes, the Company decline to answer, and thereby seek to prevent the Committee from making a report to the citizens upon the very matter that they were directed to investigate, that is, the expediency of the City's taking action in regard to gas. The Company appeared here in order that they might not be injured, and because they wished to show that they were dealing fairly with the city; but when asked to demonstrate that they are dealing fairly

by showing the relation of the price which they ask to the cost price, they decline to answer. Under these circumstances, Mr. Chairman, I move that the Committee adjourn.

THE CHAIRMAN. I wish you would withdraw that motion for a moment, for I desire to ask Mr. Greenough a few questions in regard to some matters on which his information will be of value to the Committee, he being so conversant with the price of coal, and all the details of gas manufacture.

Mr. HYDE. Certainly, sir.

Q. (by the Chairman). Mr. Greenough, what does Pictou coal cost per ton at the present time?

A. $2.25, in gold at Pictou.

Q. What in currency laid down here?

A. That I cannot state. Then comes the duty of $1.25 in gold.

Q. How many feet of gas will a ton of Pictou coal produce?

A. 3¼ feet to the pound. It will make more under high heats, but that is the ordinary yield.

Q. How many thousand feet will a ton of Albert coal make?

A. About 6½ or 7 feet to the pound.

Q. What is the number of feet of gas you obtain from a mixture of Pictou and Albert coal, assuming that 25 per cent of Albert coal is used in the mixture?

A. We get about four feet to the pound from our mixture.

Q. How much of the Albert is used?

A. Ten per cent. 7½ to 10 per cent.

Q. How much coke do you obtain from a ton of Pictou coal?

A. Pictou coal contains about 65 per cent of fixed carbon. Sixty-five per cent of 2,240 pounds would give you the coke.

Q. How many gallons of coal tar do you get from a ton of the same coal?

A. I think we get from about eight to ten gallons. We get less coal tar than anybody else from our coal.

Q. What do you get a gallon?

A. That sells at $2.50 a barrel — 32 gallons to a barrel.

Q. How much coke and coal tar do you get from a ton of Pictou and Albert coal, assuming that ten per cent of Albert is mixed with the Pictou?

A. I cannot answer that question exactly, and the reason of it is this; that we have one very large tank into which the coal tar

passes, from which it is pumped as wanted, so that we don't know the stock on hand at any given time.

Q. How much coke?

A. We get less coke from the mixture. Albert makes little or no coke. We should get about 60 per cent, I should say, in round numbers, of coke.

Q. In the manufacture of a thousand feet of gas, how much does the cost of yard labor add to the cost of the gas?

A. That I cannot answer without reflection.

Q. How much is the additional cost for superintendence and office expenses?

A. That I cannot answer without examination.

Q. How much do the repairs add to the cost of a thousand cubic feet of gas?

A. Well, sir, it depends very much upon the condition of your works. They vary from 20 to 60 cents a thousand feet. In fact, they may vary from 16 to 60.

Q. What is the cost of the lime necessary to purify a thousand cubic feet of gas?

A. Mr. Roome stated it at three cents and a fraction. Our purification does not cost so much as his, I think; I should say, about three cents, or a little less.

Q. How many years has the present Gas Light Company held the charter?

A. It came into their hands in 1836. They were the third party who had it.

Q. They bought out an old failed company?

A. Yes; Mr. Robinson bought out Cyrus Alger, who had the charter.

Q. If the company were allowed to continue to supply the city and citizens with illuminating gas, would they be willing to stipulate that the City shall appoint two Directors in the company, and that whenever their profits exceed seven per cent, on the capital invested in the works, the excess shall be paid into the Treasury of the Overseer of the Poor of the City, and expended for the support and comfort of the poor?

A. Well, sir, that of course is a question which I have no power to answer. It would have to be submitted to our Directors.

Q. Will you submit that question to the Directors?

A. I will, sir, if you like.

Q. How often do you collect your bills?

A. From private consumers, we say once a quarter; from a certain class of consumers, once a month, others once a week, according to the nature of the business. In New York, they collect all bills monthly or weekly.

Q. You thereby gain nine months' interest on the first quarter, six months' on the second, and three months' on the third?

A. It is nine months to the end of the year certainly, but as all our business is for cash, it is as broad as it is long.

Q. How often do you make your dividends?

A. Quarterly.

Q. What is the actual cost of a thousand cubic feet of gas, as delivered by the Company to-day to the citizens for consumption?

A. That is the question which I have declined to answer.

The public sessions of the Committee here ended.

APPENDIX.

ESTIMATE OF COST OF GAS WORKS AND GAS.

To the Hon. Nathaniel C. Nash, Chairman of the Joint Special Committee on Gas.

Specifications and estimated cost of Gas works to be built upon the most approved plan, of the best materials, and in the most thorough manner, capable of manufacturing and distributing to the City and Citizens of Boston two millions of cubic feet of illuminating gas every twenty-four hours: —

Brick-retort house 600 x 65 feet, wall 20 feet high of an average thickness of 14 inches, the foundation to be of stone 3 feet thick and 3½ feet deep, capped with granite 10 x 16 inches, face on front side. The frame of the roof to be of iron, covered with slate,	$60,000
140 Benches of retorts, five retorts in each bench, hydraulic main, stand and bridge-pipes, condensers and washer complete,	100,000
Brick purifying-house, including engine, boiler, exhauster room and repair shop, 160 x 70 feet; cellar 130 x 70 feet, 8 feet deep,	
Eight dry lime purifyers to contain 400 superficial feet each, capable of purifying three millions of feet of gas every twenty-four hours. Centre valves, governor, connecting pipes and all necessary valves,	35.000
Engine boiler and exhauster,	2,500
5 Gas holder tanks each 102 feet diameter, 23 feet deep, walls of brick 28 inches thick at bottom and 16 at top, capped with granite 8 inches thick, including inlet and outlet pipes, $13,500 each,	67,500
5 Telescope gas holders, 100 feet diameter, each in two sections, each section 22 feet deep, to weigh 85 tons each, 425 tons, at $300,	127,500

Supporting columns, girders, chains, pulleys and counter weights, 100 tons for each gas holder, in all 500 tons, $90			$45,000
3 Coal sheds of wood 500 x 70 feet, 16 feet high, capable of holding 10,000 tons each,			21,000
Office and station meter room of brick, 60 x 30, two stories,			3,500
Station meter, rated to measure 2,500,000 feet of gas every twenty-four hours,			8,000
60 miles of street mains, number of feet of each size as follows: —			
3,000 feet of	40 inch,	$12.00	36,000
15,000 "	24 "	6.75	101,250
10,000 "	16 "	4.60	46,000
20,000 "	10 "	2.58	51,600
20,000 "	8 "	2.00	40,000
50,000 "	6 "	1.50	75,000
100,000 "	4 "	1.00	100,000
98,800 "	3 "	75	74,100
16,000 meters,			200,000
16,000 supplies,			85,000
			$1,278,950
Engineering,			12,000
			$1,290,950
To meet any contingent expenses that may be incurred, add 10 per cent.			129,095
			$1,420,045

The cost of putting down pipe and all necessary crosses, Ts, turns, and drip-boxes, is included in the above-estimated cost of pipe.

Estimated cost of gas per 1,000 cubic feet, made in works, manufacturing and distributing one million cubic feet every twenty-four hours on the average, from a mixture of $\frac{9}{10}$ of Pictou and $\frac{1}{10}$ Albert coal costing $9.50 per ton, and producing four feet to the pound, tax not included.

Coal,	$1.07
Lime,	3
Labor,	22
Repairs,	10
Interest allowing a capital of $1,750,000	28
Salaries and office expenses,	8
Loss from leakage and condensing,	.15
	$1.93
Deduct value of coke and tar,	30
	$1.63

The above estimates are based upon the present high prices of labor and materials, and the location of the works on solid ground, not exceeding three thousand feet distant from Washington or Tremont Street. For any additional distance not exceeding twenty-five hundred feet, the cost of main pipe laid, will be $12 per foot, and for any greater distance $15.

To meet any demand growing out of an increased consumption of gas, the estimate is for purifiers and station meter one-third larger than at present are required.

Should the consumption increase to over two millions of feet every twenty-four hours, another gas holder will be required of the same capacity as those above estimated.

From six to eight acres of land will be required for the works; but no location having been selected, and no price fixed, no estimate of the cost is here made.

Should it be found best to inclose the gas holders in circular brick buildings, instead of supporting them with the columns estimated, five thousand dollars will be added to the cost of each.

GARDNER WARREN.

Boston, *Dec.* 26, 1866.

OPINION OF THE CONSULTING PHYSICIANS.

To the Hon. Nathaniel C. Nash,

Chairman of a Special Committee of the Common Council.

Sir, — The Consulting Physicians, to whom you have addressed the following inquiries, viz.,

"Whether, in their judgment, gas works of the magnitude of the Boston Gas Light Company, located within the city, endanger the health and well being of the citizens living at the north part of the city; and whether, as a sanitary measure, the manufacture of illuminating gas, made from bituminous coal, should not be prohibited within the city limits," — make the following reply: —

It is true that the manufacture of noxious or deleterious gases or vapors is more or less unfavorable to the health and comfort of those exposed to their influence; but the degree of injury produced by such influences, which vary greatly in different kinds of manufactures, can only be measured by an observation of the practical results in each case.

The consulting physicians, in common with other sanitarians of the present time, hold in substance the following opinions in regard to such manufacturing and industrial establishments, and the propriety of their being located in the midst or on the borders of centres of population: —

They are frequently inconvenient and sometimes unhealthy to the neighborhood. The odors they give off, the vapors or smoke they emit, may render the

surrounding space, within a certain radius, very disagreeable, or even unfit for habitation, giving legitimate cause for complaint, and justly calling for measures for prevention.

Such establishments are divided into three classes, according to the degree in which they are dangerous, insalubrious, or inconvenient.

In the first class are those that must be kept at a distance from private habitations, but need not be prohibited in the outskirts of a town; such as abattoirs, establishments for the calcination of bones, the manufacture of mineral acids, animal charcoal, and Prussian Blue, where the smoke and gases are not consumed; so of poudrette, and many others.

In the second class are those which do not rigorously require their being kept at a distance from habitations, but the erection of which should not be allowed, until assurance has been obtained that the operations proposed to be carried on in them are so executed as not to prove a nuisance or damage to the neighborhood.

In the third class are those which may remain, without inconvenience, near dwellings; but which should be subject to the surveillance of the Board of Health.

Gas works and gasometers are among the factories of the second class.

The immense furnaces indispensable for the manufacture of a product essentially inflammable, as gas, necessarily incur danger by fire; at the same time that they produce a considerable amount of smoke and odorous gas, offensive to the neighbors. The danger of the bursting of the gasometer has been much exaggerated; indeed, when filled with gas, it is considered impossible; and an explosion can only occur when a small quantity of gas escapes, from any cause, into a close apartment; and it is the mixture of this and common air, which on contact with a light, is so frequently the cause of such an occurrence.

The disposal of the residues furnished by the products of condensation and purifying, viz., coal tar and the odors communicated by it to the washing waters, and in the water of the meters, in union with another disagreable product, sulphuretted hydrogen, is of great importance. These should not be allowed to enter the drain or to be discharged into the docks or water-courses.*

In applying the principles above briefly adverted to, to the case presented for their consideration, the consulting physicians express the opinion that the manufacture of gas by the Boston Gas Light Company is not insalubrious to such an extent as to "endanger the health and well being of the citizens living at the north part of the city." They think that some improvement could be made in the works, not absolutely required perhaps, but which would tend to remove any existing offensiveness.

The physicians, in reply to the second inquiry, recommend that, as the quan-

* See laws regarding noxious trades, &c., in France, as reported by Dr. Waller Lewis to the English General Board of Health.

tity of gas required for use may become exceedingly great in the future with the increase of population, all gas manufactories erected hereafter shall be located at a distance from the habitations of the citizens.

This answer to your communication is, of necessity, very brief; the time afforded us for the consideration of so important an interest, involving the necessity of visiting and examining the works in Commercial Street, being too short to admit of a more full investigation.

We remain, sir, respectfully,

Your obedient servants,

JOHN JEFFRIES.
HENRY G. CLARK.
WINSLOW LEWIS.
D. HUMPHRYS STORER.
CHAS. E. BUCKINGHAM.

Boston, Dec. 20, 1866.

OPINION OF THE CITY PHYSICIAN.

City Physician's Office,
Boston, Dec. 17, 1866.

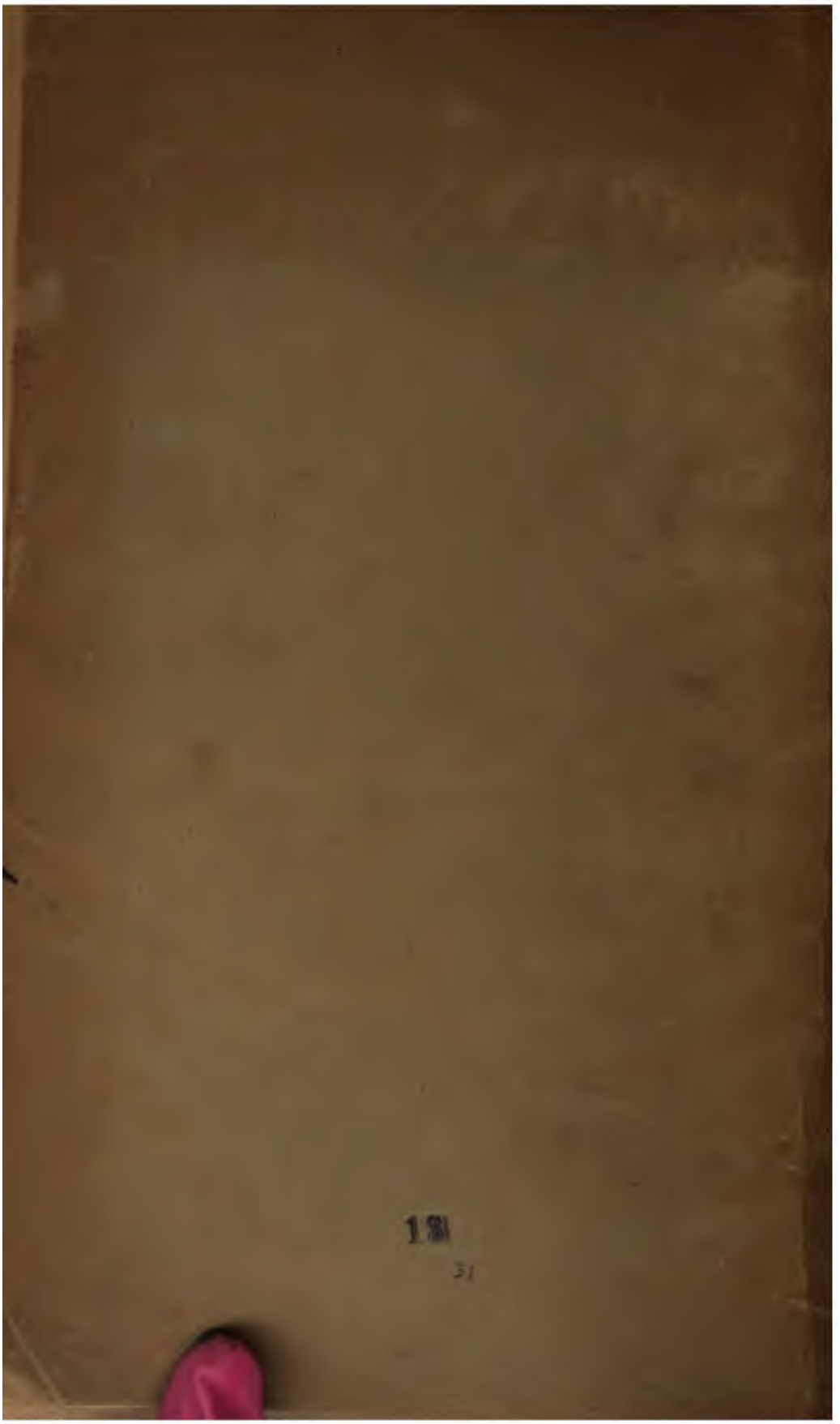
N. C. Nash, Esq.,
Chairman, Com. on Gas Co.

Dear Sir, — In reply to your inquiry, whether, in my opinion, gas works on the scale of those now operated by the Boston Gas Light Company are detrimental to the health of the neighborhood where they are located, I must respectfully reply, that, in addition to the usual annoyances and deleterious matters which are generated in the workings of any great manufacturing establishment, we have in this case the substance manufactured itself, a gas which, when brought in contact with the lungs, is deadly poison. I am perfectly aware that all the precaution possible is taken to prevent the escape of the gas; but, in spite of this, there are occasions when the odor is perceptible, and its presence the cause of great annoyance if not of actual danger to susceptible individuals. With regard to your question, whether I would be willing to occupy a house in the immediate vicinity of such works, I must unhesitatingly reply in the negative. I would on no consideration voluntarily subject myself or my family to the chance of inhaling or being annoyed by the smell of this gas.

Respectfully, your obedient servant,

WILLIAM READ, M.D.,
City Physician.

Alderman, N. C. Nash,
Chairman, Com. on Gas Co.



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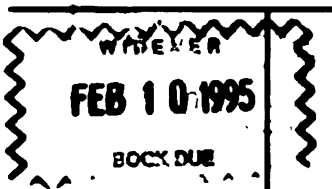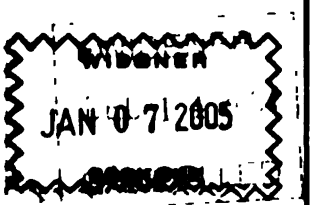
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